TATSHENSHINI-ALSEK REGION WILDERNESS STUDY

British Columbia

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For
Tatshenshini-Alsek Wilderness Study
Steering Committee
B.C.

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Forward

In July, 1992, the British Columbia (B.C.) provincial government announced that the B.C. Commission on Resources and Environment will implement a process intended to evaluate land and water use options for the Tatshenshini-Alsek region. This report will be provided to the Commission as background information to assist in that process.

This report summarizes the wilderness values, as they are currently understood, of the Tatshenshini-Alsek Region. The Tatshenshini-Alsek Region Wilderness Study Steering Committee (a federal\provincial inter-Ministry committee) commissioned the work to review and evaluate existing knowledge on the wilderness resources of the region, and to determine what further research was required. This study does not attempt to compare the value of wilderness to other resources, nor is any judgement made on the appropriate land use in the region.

Wilderness values mean a great deal more than recreation in wild places, and this report reflects the mosaic of natural and cultural resources that together comprise the region's wilderness qualities.

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Ministry of Environment, Lands and Parks, B.C.
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TABLE OF CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION 1

1.1 Scope Of Work And Approach 1
1.2 Study Methods And Conventions 3

2.0 NATURAL RESOURCES 4

2.1 Study Area Description 4

2.2 Climate 4

2.3 Ecological and Landscape Classification 5
2.3.1 Ecoprovinces And Ecoregions 5
2.3.2 Biogeoclimatic Zones 5
2.3.3 Regional Landscapes And Special Features 7

2.4 Hydrology & Water Quality 9

2.5 Geology And Terrain Features 10
2.5.1 Geology 10
2.5.2 Geomorphology 11
2.5.3 Terrain Materials and Soils 12

2.6 Vegetation 13
2.6.1 Tatshenshini- Alsek Area 13
2.6.2 Haines Highway Area 15
2.6.3 Tarr Inlet 16

2.7 Wildlife Habitat And Populations 16
2.7.1 Regional Overview 16
2.7.2 Wildlife Habitat and Biogeoclimatic Zones 17
2.7.3 Wildlife in Tatshenshini-Alsek River Area 18
2.7.4 Wildlife in Haines Highway Area 21
2.7.5 Chilkat Eagle Preserve 22

2.8 Fish Habitat And Populations 22

2.9 Rare, Threatened Or Endangered Species 23

2.10 Biodiversity 24

2.11 Research Needs 26

3.0	CULTURAL RESOURCES	28
3.1	Introduction	28
3.2	Prehistory	28
3.3	Aboriginal History	30
3.4	European And Euro-Canadian Historical Chronology	33
3.5	Cultural Resources and Research Needs	34
4.0	VISUAL RESOURCES	36
4.1	Visual Resource Measurement	36
4.2	Visual Resources And Wilderness	38
4.3	Visual Resources In The Study Area	38
4.4	Visual Resource Ratings	39
4.5	Research Needs	40
5.0	RECREATION AND TOURISM RESOURCES	41
5.1	Definitions And Methods	41
5.2	Recreation Features, Capability And Significance	41
5.2.1	Recreation Features	41
5.2.2	Recreation Capability And Significance	45
5.2.3	Existing Recreation Access	45
5.2.4	Recreation Opportunity System	46
5.3	Recreation Use	46
5.3.1	Existing And Potential River Users	46
5.3.2	Guide-outfitting and Hunting	48
5.3.3	Native Food Fisheries and Sport Fishing	49
5.3.4	Wildlife Viewing	49
5.3.5	Mountaineering And Hiking	50
5.3.6	Cross-Country Skiing and Snowmobiling	51
5.3.7	Vehicle Touring/Scenic Viewing	51
5.3.8	Other Uses	51
5.4	Recreation Use And Limits Of Acceptable Change	52

5.5	Tourism Capability And Attractiveness	53
5.5.1	Tourism Resource Description	53
5.5.2	Climate	55
5.5.3	Location	55
5.5.4	Access	55
5.5.5	Land Status	56
5.5.6	Tourist Profile	56
5.5.7	Tourism Products	56
5.5.8	Tourism Resource Capability Summary	60
5.6	Research Needs	60
6.0	WILDERNESS RESOURCE ECONOMIC VALUES	62
6.1	Wilderness Use Values	62
6.2	Non-use Preservation Values	64
6.3	Future Wilderness Values	65
6.4	Methodology Limitations	66
6.5	Economic Values Related To Wilderness In Study Area	66
6.5.1	In The Province	66
6.5.2	Previous Studies In The Region	67
6.5.3	The Situation Now	68
6.6	Research Needs	72
7.0	LAND USE AND JURISDICTION	73
7.1	Existing Land Status	73
7.2	Native Uses, Land Claims	73
7.3	Fishing	73
7.4	Hunting	73
7.5	Trapping	73
7.6	Recreation	75
7.7	Mineral Claims	75
7.8	Government Reserves And Interests	75
7.9	Lots, Leases, Licenses, Interests And Rights	76
7.10	Roads, Pipelines, Airstrips	76

7.11 Adjacent Jurisdictions 76
7.11.1 United States And Canada 76
7.11.2 Kluane National Park Reserve 76
7.11.3 Adjacent Yukon Lands 77
7.11.4 Glacier Bay National Park And Preserve 78
7.11.5 Tongass National Forest 78
7.11.6 Wrangell-St.. Elias National Park 79
7.11.7 Chilkat Eagle Preserve 79
7.11.8 Chilkoot National Historic Park 79

7.12 Research Needs 79

8.0 WILDERNESS SIGNIFICANCE 80

8.1 Criteria For Measuring Significance 80

8.2 Previous Work On Significance 80

8.3 Questions And Answers: Preliminary Conclusions 81

8.4 Assessing the Tatshenshini-Alsek Rivers 86

8.5 Summary of Wilderness Study Conclusions 90

9.0 SUMMARY OF RESEARCH NEEDS AND RECOMMENDATIONS 92

9.1 What We Know And What We Need 92

9.2 Research Recommendations 95

9.3 Research Methodology, Schedule And Budget 98
9.3.1 Methodology 98
9.3.2 Schedule And Budget 100

BIBLIOGRAPHY 103

APPENDIX 108

Maps

Study Area Location IV
Ecoregions and Wildlife Habitat 6
Historic Routes and Sites 29
Place Names, Land Use, Old Roads 74
Tatshenshini-Alsek River Features and Place Names 112

Mt. Fairweather, the highest mountain in British Columbia as seen from the lower Alsek River. (J. Peepre)

The Coast Mountains in the vicinity of the "Walker" Glacier create a dramatic glaciated landscape. The Alsek Ranges Ecosection supports flora and fauna unusual in British Columbia and Canada. (J. Peepre)

Unnamed creek north of O'Connor River confluence. Broad, braided creek valleys are typical of the Tatshenshini drainage. The creeks provide access to mountains and valley slopes next to the river. (J. Peepre)

Lush sub-alpine meadows support coastal and interior species near the O'Connor River confluence. These meadows are also seasonal bear habitat. (J. Peepre)

EXECUTIVE SUMMARY

Scope of Work

This report assesses the wilderness resources of the Tatshenshini-Alsek region, also known as the "Haines Triangle" in northwestern British Columbia. The study area includes Mt. Fairweather and Tarr Inlet on the Alaska border, east to the Haines Highway corridor, and north to the Yukon border, taking in both the Tatshenshini and Alsek Rivers.

Provincial lands are emphasized in the report, yet wilderness resources in this region cross provincial-territorial and international boundaries. This wilderness assessment recognizes the transboundary nature of these resources.

Study Area Description

Two major rivers, the Alsek and its tributary the Tatshenshini, drain the Haines Triangle region, cutting through the Coast Mountains to Alaska and the Pacific Ocean. Several different biomes overlap in this region, creating an unusual biological diversity with several species at the northern or southernmost limits of their range. The Pacific influence and a complex glacial history have produced an exceptionally diverse range of biophysical conditions from lowlands to alpine tundra, from lush coastal forest and wet meadows to dry interior spruce forest. Many animal and plant species rare or unusual in British Columbia and Canada inhabit this region.

Part of the Haines Triangle lies in the St. Elias Mountain Range that has the largest non-polar ice-cap in the world. Some of the biggest valley glaciers in Canada are found here, and Mt. Fairweather, the highest peak in the province towers above them all.

The region is known worldwide as a scenic wilderness highlighted by the two wild rivers: the Tatshenshini and Alsek. Yet much of the area is also viewed as homeland by the Champagne-Aishihik people and their coastal neighbours, the Tlingits. The cultural history and diversity of the region is linked to natural resources, much as modern recreation or subsistence uses are dependent on the wilderness. Except for the Haines Highway on the eastern side of the study area and the Windy Craggy mineral exploration site, the Haines Triangle has no active roads.

Study Purpose

This report does not recommend any particular land use strategy for the region, nor does it address wilderness management issues. The study emphasizes what wilderness qualities are found in the region, what uses are made of the wilderness now, what benefits arise from the wilderness, why the wilderness is valued by society, and what further research is needed.

Wilderness, as defined in this report, is not solely about recreation in wild places, although recreation is an important consideration. The purpose of this study is to define wilderness in its broadest sense, including all of the resources and uses that together define the region's biological and cultural diversity. The sensitivity of wilderness resources and the limits of acceptable change to wilderness are addressed in this study, but answers to these questions must await future research work.

Conclusions

The wilderness study reviews much of the literature and anecdotal information available for the Tatshenshini-Alsek region. It concludes that the many public statements made about the region's superlative biotic, abiotic and cultural features in a scenic wilderness setting are accurate. As the first effort at a comprehensive summary of wilderness resources in the region, the study reveals that appreciation for the region's attributes has, if anything, been undervalued.

The main conclusion of this work is that very little is known about the Tatshenshini-Alsek region. More questions than answers remain about the wild species and natural forces that shape the environs. There is limited understanding of how changes in land use might affect wildlife habitat, or plant and animal species populations. These questions are described more fully in a recommended research program found in the report.

This assessment confirms that the Tatshenshini-Alsek region has, in a provincial, national, and in some cases international context*:

Primary Wilderness Attributes in the Study Region

- **outstanding examples of representative landscapes,**
- **habitat essential for the preservation of rare species,**
- **habitat essential for the survival of significant populations of terrestrial mammals, avifauna, and freshwater fish,**
- **areas and sites of significant cultural, archaeological, historical and traditional resource gathering value,**
- **examples at specific sites of outstanding or unique landforms or geological features,**
- **outstanding areas for public recreation, tourism and nature or culture appreciation,**
- **outstanding wilderness attributes as a composite of all of the above criteria.**

* Criteria adapted from Canadian Environmental Advisory Council (1991).

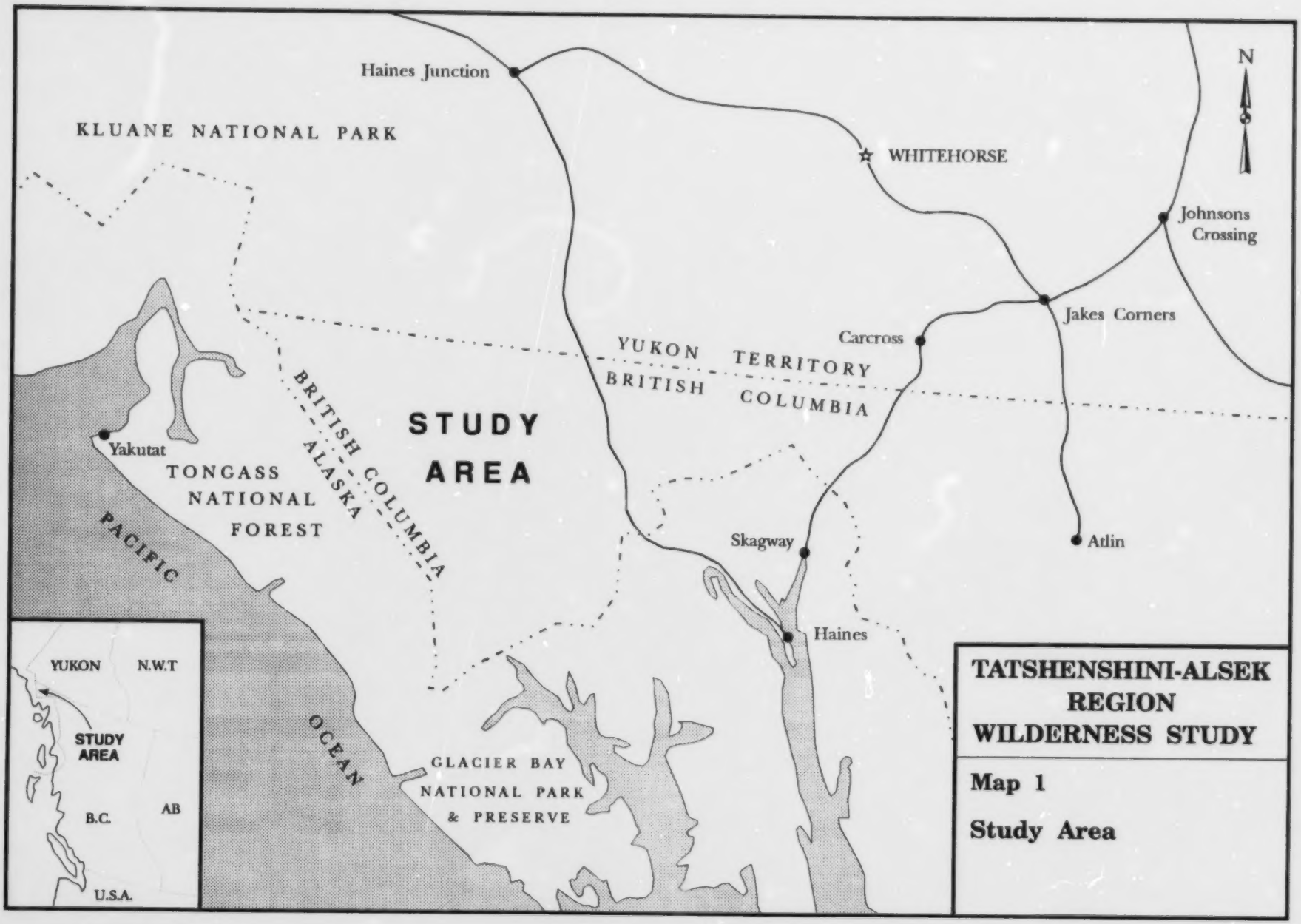
The most notable specific wilderness features of the Tatshenshini-Alsek Region based on this assessment include:

- the Alsek Ranges ecosection has ecological conditions found nowhere else in Canada,
- unusual biological diversity for such a high latitude, resulting from a coastal influence, the meeting of several different biomes, and a complex glacial history,
- at least two provincially rare mammal species such as the tundra shrew and collared pika, and two rare sub-species including the blue glacier bear, and Dall's sheep,

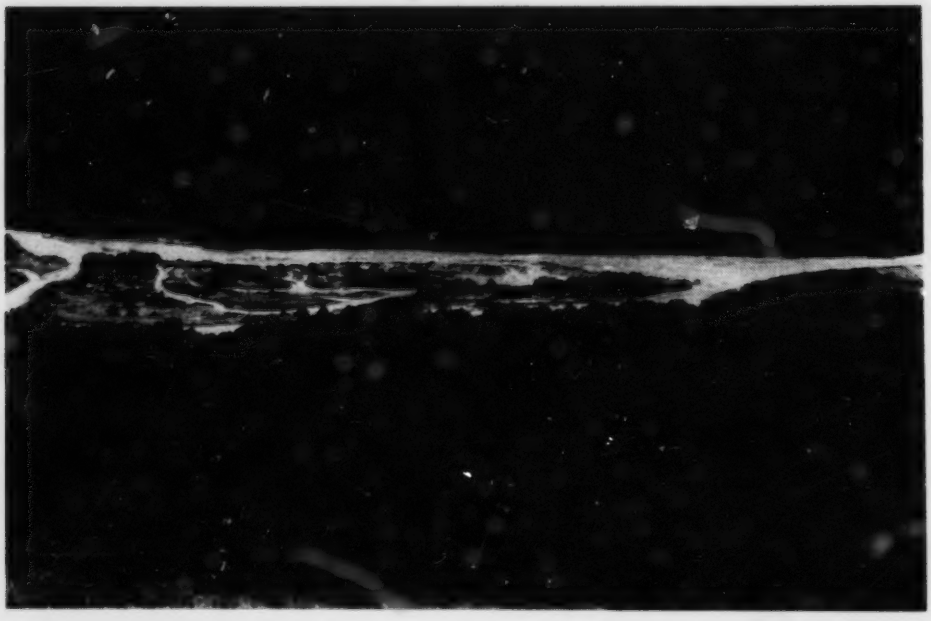
- several provincially rare bird species including king eider, Arctic tern, gray-cheeked thrush, lesser gold-plover, Pacific loon, wandering tattler to name a few,
- at least 30 provincially rare plant species, some of which may be rare to Canada; species rare to B.C. include "northern" ground cone,
- numerous notable wildlife species populations inhabiting an intact wilderness ecosystem, including grizzly bear, Dall's sheep, bald eagle, moose, gyrfalcon, peregrine falcon,
- some of the best grizzly bear habitat in Canada,
- nationally significant geomorphological features and processes, relating mainly to glacial and fluvial processes,
- provincially significant cultural features including native heritage, archaeological sites, historic sites and routes,
- nationally significant recreation features, and wilderness recreation capability,
- internationally significant adventure tourism capability,
- substantial economic values to the region and province derived directly from the study area's wilderness attributes,
- subsistence harvesting has important cultural and economic values in the region.

The mosaic of wilderness attributes, natural and cultural resources found in the study region are not protected elsewhere in Canada or the United States. Many of these attributes and resources are unique to the region, not found elsewhere in Canada or British Columbia. Nearby Kluane National Park Reserve in the Yukon, and Glacier Bay National Park and Preserve in Alaska are of world heritage stature, yet they are incomplete representations of the region's biological diversity.

The study further confirms that the Tatshenshini and Alsek Rivers are nationally and provincially significant wild rivers. Along the Canadian northwest coast only four rivers, the Stikine, Taku, and Tatshenshini-Alsek have similar characteristics. When all assessment criteria are compared, the Tatshenshini-Alsek Rivers have superior wilderness attributes, including diversity of landforms, biophysical and cultural resources, scenic quality, recreation features and wilderness recreation and tourism potential. Only the Stikine River provides a comparable wilderness recreation experience through interior, transitional and coastal ecosystems.

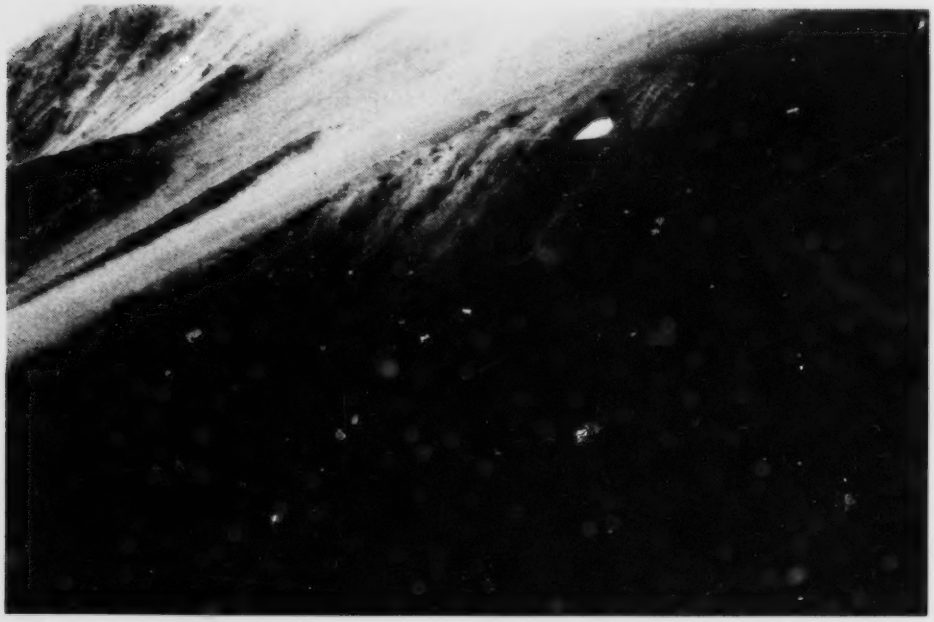

Haines Junction
KLUANE NATIONAL PARK
WHITEHORSE
N
Johnsons Crossing
Jakes Corners
Carcross
YUKON TERRITORY
BRITISH COLUMBIA
BRITISH COLUMBIA
ALASKA
STUDY AREA
Yakutat
TONGASS NATIONAL FOREST
PACIFIC
OCEAN
Skagway
Atlin
Haines
GLACIER BAY NATIONAL PARK & PRESERVE
YUKON
N.W.T
STUDY AREA
B.C.
AB
U.S.A.
TATSHENSHINI-ALSEK REGION WILDERNESS STUDY
Map 1
Study Area

Dalton Post (Shaw'ashe) on the Chilkat Trail to the interior, was located near the Tuchone village of Heskathin. (J. Peepre)



Open ridges provide hiking routes to alpine meadows above the Tatshenshini River. This photo shows the Tatshenshini Basin Ecoregion, within Boreal White/Black Spruce and Spruce-Willow-Birch biogeoclimatic zones. Note the wetland beside the river. (J. Peepre)

Dryas meadows are easily damaged by excessive trampling, but the creek fans are dynamic with ever-changing channels and the colonization of old creek beds. (J. Peepre)



Dall's sheep habitat is located along the South-facing slopes of the Tatshenshini River valley. The region supports part of the only Dall's sheep population in British Columbia. (J. Peepre)

1.0 INTRODUCTION

1.1 SCOPE OF WORK AND APPROACH

Study Area

This report assesses the wilderness resources of the Tatshenshini-Alsek region, also known as the "Haines Triangle" in British Columbia. The study area includes Mt. Fairweather and Tarr Inlet on the Alaska border, east to the Haines Highway corridor, and north to the Yukon border, taking in both the Tatshenshini and Alsek Rivers. (Refer to Map #1).

The report focuses on resources within the province, yet the landforms, rivers, fish, wildlife, tourism, cultural, scenic, and other resources related to wilderness in this region cross provincial-territorial and international boundaries. A comprehensive wilderness assessment must recognize the transboundary nature of these resources. When the affects of resource development cross international boundaries, the beneficial or adverse impacts on adjacent jurisdictions are normally considered. Similarly, wilderness resources in this region are best treated in a regional context, since many values derived from the wilderness extend well beyond provincial or Canadian boundaries.

Study Purpose

This report does not recommend any particular land use strategy for the region, nor does it address wilderness management issues. The study emphasizes what wilderness qualities are found in the region, what uses are made of the wilderness now, what benefits arise from the wilderness, why the wilderness is valued by society, and what further research is needed. Wilderness, as defined in this report, is not solely about recreation in wild places, although recreation is an important consideration. The purpose of this study is to define wilderness resources in their broadest sense, including all of the resources and uses that together define the region's biological and cultural diversity. The sensitivity of wilderness resources and the limits of acceptable change to wilderness are addressed in this study, but the answers must await future research work.

Definitions and Study Context

Much has been written about wilderness, yet our attempts to describe and assess it are still far from complete. This report does not revisit the literature on wilderness, except to describe a context for the study. Since few wilderness assessments of this nature have been completed in the province, it was necessary to describe assessment methods and refer to the experience of others.

The primary objectives of protected areas as identified by Eidsvik (1992), serve as a useful outline of wilderness attributes. These attributes exist now in the study area and are outlined here, since they are a part of assessing the significance of the Tatshenshini-Alsek wilderness.

Wilderness:

- *maintains essential ecological processes and life support systems;*
- *preserves genetic and biological diversity;*
- *protects aesthetic values and natural ecosystems;*
- *conserves watersheds and their production;*

- *controls erosion, sedimentation and soil depletion;*
- *maintains air quality;*
- *protects habitat of representative as well as rare and endangered species;*
- *provides opportunities for research, education and monitoring;*

- *provides opportunities for ecotourism and recreation;*
- *contributes to sustainable use;*
- *protects natural and cultural heritage;*
- *retains future options.*

(after Eidsvik, 1992)

Wilderness values are reasons, rooted in philosophy and culture, for wanting wilderness (McCloskey, 1990). Values totally dependent on wilderness may be different from those values commonly associated with it, but which may be found elsewhere, too. Superb scenery, for example, does not require a wilderness setting, although it is often associated with wilderness. Wilderness benefits are advantages enjoyed by society, and wilderness uses are the ways in which individuals or groups utilize wilderness to gain satisfaction (McCloskey, 1990). In the north and elsewhere in Canada, the subsistence values and benefits of wilderness are of great importance, but until recently have been overlooked in most wilderness assessments.

In past years, wilderness has often been associated with the "wilderness recreation experience," a utilitarian view that focuses on uses. Yet preservation has always been intrinsic to the nature and value of wilderness, through the realization of personal benefits, human welfare, and more recently the universal rights of all beings (Cordell and Reed, 1990). The debate between anthropocentric and biocentric views pervades the literature on wilderness and wilderness management, yet both are essential to understanding the full values of wilderness. By many accounts, recreation is declining in its importance in the scheme of wilderness values, with the understanding that the "most basic value of wilderness is its capacity to preserve nature (McCloskey, 1990, Cordell and Reed, 1990)".

This report embraces the perspective that wilderness is a composite of many different values, uses and benefits. Landforms, ecosystems, biodiversity, wildlife habitat and populations, scenery, human use and many other factors together define the wilderness character of the region. Each aspect makes a contribution to wilderness qualities, yet collectively the whole is greater than the sum of the parts.

Wilderness has many rich cultural associations, but the Euro-Canadian view usually describes wilderness as vast spaces "untrammeled by man". We sometimes recognize that cultural resources in wilderness include prehistoric and historic sites, and other remnants of the past, but are unsure of how to treat these apparent anomalies as perceived from the Euro-Canadian cultural outlook. In the study region and in many other parts of Canada, "wilderness

is the repository of many traditional subsistence values, activities, and lifestyles, as well as preserving cultural diversity in modern societies (Muth and Glass, 1988)". The Tatshenshini-Alsek region can not be regarded only as a remote northern wilderness. To the Champagne-Aishihik First Nation, this region is part of their ancestral homeland, now lying a short distance south of where their families now reside. Other residents of the region, both Canadian and American, regard the wilderness as "just next door".

1.2 STUDY METHODS AND CONVENTIONS

This study is Phase 1 of a program to establish the wilderness values, benefits and uses in the Tatshenshini-Alsek River region. Study methods were restricted to reviewing existing information and interviewing a limited number of knowledgeable individuals, supplemented by the author's personal experience in the region. Although the report provides little new information, it is presented in a fresh context: that of wilderness values. The information was collected from many different sources, but this report is the first comprehensive assessment of wilderness values in the region. Where information was unavailable, further research needs are identified in order of priority.

The report does not attempt to provide the same level of detail on biophysical resources as may be found in other reports or maps on wildlife, recreation or other resources. It is a thematic summary of key natural and cultural resources and human use from a wilderness perspective.

Scientific Nomenclature and Species Rarity

The report is primarily a qualitative assessment of wilderness values, although quantitative measures are applied where appropriate. Scientific nomenclature is not used, unless clarification of a particular species is warranted.

Rare and unusual species are identified throughout the report. In most cases the respective authors have identified these species as rare to the province or region, but in some cases as rare in Canada. Rarity is not rigorously classified in this study, since many surveys have thus far been of a reconnaissance nature, and some were conducted prior to the adoption of more recent classification systems. Unusual species are those that may be at the northern or southern limits of the their range, or uncommon in some other respect. Unusual species may not be rare, but may be of special interest for scientific purposes or wildlife viewing. Since different authors have used varying ways to define rarity, further research is needed to classify these species accurately. Where classified, rarity adheres to the B.C. Conservation Data Centre ranking.

2.0 NATURAL RESOURCES

2.1 STUDY AREA DESCRIPTION

The study area lies in the rugged northwestern corner of British Columbia, known as the "Haines Triangle." Two major rivers, the Alsek and its tributary the Tatshenshini, drain the region, cutting through the Coast Mountains to Alaska and the Pacific Ocean. Several different biomes overlap in this region, creating an unusual biodiversity with several species at the northern or southernmost limit of their range. The Pacific influence and complex glacial history has produced an exceptionally diverse range of biophysical conditions from lowlands to alpine tundra, from lush coastal forest and wet meadows to dry interior spruce forest. Many animal and plant species rare or unusual in British Columbia and Canada inhabit this region.

Part of the Haines Triangle lies in the St. Elias Mountain Range that has the largest non-polar ice-cap in the world (Canadian Parks Service, 1985). Some of the biggest valley glaciers in Canada are found here, and Mt. Fairweather, the highest peak in the province towers above them all.

The region is known worldwide as a scenic wilderness highlighted by the two wild rivers: the Tatshenshini and Alsek. Yet much of the area is also viewed as homeland by the Champagne-Aishihik people and their coastal neighbours, the Tlingits. The cultural history and diversity of the region is linked to natural resources, much as modern recreation uses are dependent on the wilderness. Except for the Haines Highway on the eastern side of the study area, the Windy Craggy mineral exploration and two old unused mining access roads, the Haines Triangle has no active roads.

2.2 CLIMATE

The upper Tatshenshini and Alsek Rivers are in a dry, cold, continental climate zone, with a maritime influence from the coast. The St. Elias Mountains moderate local conditions. The maritime influence increases closer to the coast. Cyclonic storms from the Gulf of Alaska rise over the St. Elias Ranges, producing a rainshadow effect further inland.

The climate of the Alsek Ranges is a cold transitional type, drier than the coastal belt, but moist and less continental than the upper Tatshenshini valley to the east (Pojar, field notes, 1991). Much of the region lies in the Tatshenshini Basin between the St. Elias Mountains and the Northern Boundary Ranges of the Coast Mountains, in the St. Elias-Coast Mountains climate region of Wahl et. al. (1987, as quoted in Geddes Resources, 1990). The B.C. Parks Branch describes the climate as: Northern Mountain Transition/North Central Interior; Coastal/Sub-arctic Montane Mix.

Mean annual precipitation is in the 500mm range in the upper Tatshenshini valley increasing to 2,000mm near the coast. Drier conditions are found nearer Haines Junction to the north and Kusawa Lake to the east. Predicted normal annual precipitation at the Windy Craggy station is 1880mm, 70% as snow, 30% as rain (Geddes Resources, 1990). Intense rainfall in September and October has reached maximum daily totals in excess of 100 mm. Mean daily July temperature is less than 14C, with the above station reporting 10.5, 12.4 and 10.4C for June, July and August. The January mean temperature for the Windy Craggy station is estimated to be -23.4C with a July mean of 3.5C (Geddes Resources,1990). Temperatures decrease with increases in elevation. July receives 10 to 13 days of precipitation, and January

gets 14 to 17 days. Local weather conditions during summer are variable, with frequent poor weather or spells of clear, sunny days.

The St. Elias Mountains are one of the windiest areas on the continent due to storms originating in the Gulf of Alaska (Wahl et al. 1987). In the mountains, the complex topography affects wind direction and intensity. Colder air drains off glaciers, also affecting local wind conditions. Local glacial climates are characterized by colder annual temperatures, higher snow accumulations, and cold air drainage from mountain slopes.

2.3 ECOLOGICAL AND LANDSCAPE CLASSIFICATION

British Columbia has distinctive ecological regions that have been described using two systems. The ecoregion classification system divides the province into physiographic climatic units, called ecoprovinces, ecoregions, and ecosections (Demarchi, 1988).

Biogeoclimatic zones and sub-zones are altitudinally different environs based on vegetation, soil and climate. Different biogeoclimatic zones may fall within an ecoregion or ecosection, mainly due to variations in elevation.

The region has ecological characteristics found nowhere else in B.C. or Canada. The ecology of the coastal transition zone around the Tatshenshini-Alsek River confluence is unusual, yet the area is not well understood. Several species rare to the province have been recorded in this ecosection. Further to the east in the Haines Summit area, a transition zone from coastal to sub-alpine and alpine vegetation occurs in a short distance, also resulting in species habitat unusual in B.C..

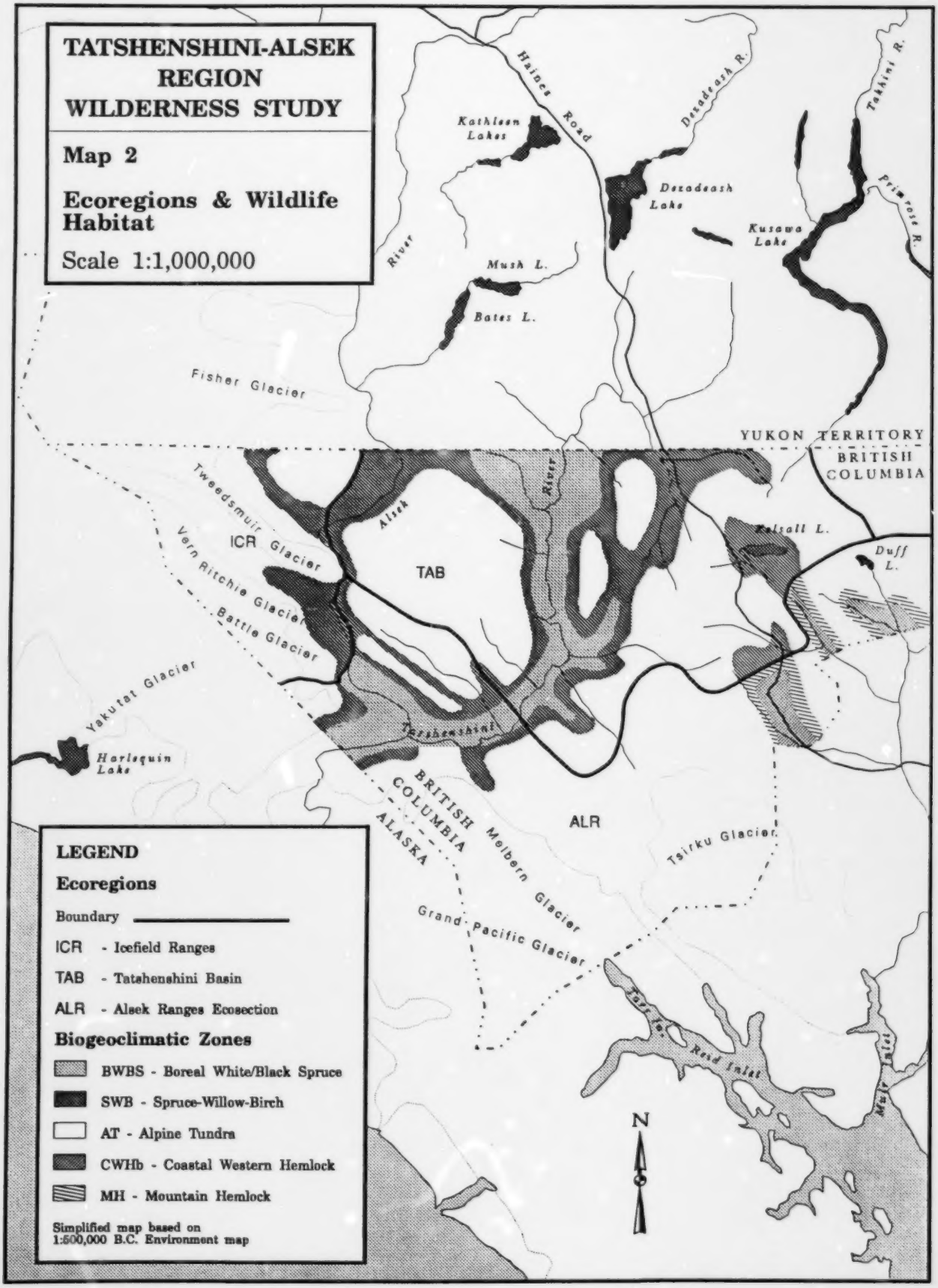
2.3.1 Ecoprovinces And Ecoregions

Much of the study area falls within the Coast and Mountains ecoprovince, which extends from the northernmost part of the province to the lower mainland. (See Map #2). The northwestern part of the study region lies in the Icefield Ranges ecoregion. The southern coastal portion of the Tatshenshini-Alsek area is part of the Alsek Ranges ecosection while the interior part lies within the Tatshenshini Basin ecoregion (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990). The Tatshenshini Basin ecoregion is part of the Northern Boreal Mountains ecoprovince.

The Alsek ranges ecosection is unique to B.C. and Canada, and is more typical of Alaskan coastal ecosystems (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990). This ecosection extends downstream from near the O'Connor River confluence on the Tatshenshini River, and downstream from the Tweedsmuir Glacier on the Alsek River. It includes the Tarr Inlet area as well as the southernmost parts of the Haines Road/Klehini River area. Biodiversity in this ecosection is influenced by the coastal conditions and a number of species rare or unusual to the province and Canada exist in this area.

2.3.2 Biogeoclimatic Zones

Within the Icefield Ranges Ecoregion, Tatshenshini Basin Ecoregion and the Alsek Ranges Ecosection lie a diverse range of biogeoclimatic zones, from coastal forests to alpine tundra. In northern British Columbia and along the Canadian portion of the Pacific north coast, few other areas support this range of zonal diversity. (See also Map #2.)


TATSHENSHINI-ALSEK REGION WILDERNESS STUDY
Map 2
Ecoregions & Wildlife Habitat
Scale 1:1,000,000
Haines Road
Dezadeash R.
Takhini R.
Kathleen Lakes
Dezadeash Lake
Kusawa Lake
Primrose R.
Bates L.
Fisher Glacier
YUKON TERRITORY
BRITISH COLUMBIA
Tweedsmuir Glacier
Vern Ritchie Glacier
Battle Glacier
Alsek River
ICR
TAB
Kaisali L.
Duff L.
Yakutat Glacier
Harlequin Lake
Tatshenshini
BRITISH COLUMBIA
ALASKA
ALR
Melbern Glacier
Tsirku Glacier
Grand Pacific Glacier
Tarr Inlet
Reid Inlet
Muir Inlet
N
LEGEND
Ecoregions
Boundary
ICR - Icefield Ranges
TAB - Tatshenshini Basin
ALR - Alsek Ranges Ecosection
Biogeoclimatic Zones
BWBS - Boreal White/Black Spruce
SWB - Spruce-Willow-Birch
AT - Alpine Tundra
CWHb - Coastal Western Hemlock
MH - Mountain Hemlock
Simplified map based on 1:500,000 B.C. Environment map

The Tatshenshini Basin ecoregion has fairly typical biogeoclimatic zonations for a cold dry climatic region. These include the cordilleran boreal white and black spruce subzone, sparsely treed with relatively low snow depth (BWBSe); spruce-willow-birch zone, with willow and slide alder shrubland more abundant than forest (SWB); and the alpine tundra zone, with dry cold conditions supporting grasses, dwarf willow, mountain-avens and lichen (AT). Conditions change fairly abruptly near the O'Connor River where the Alsek Ranges ecosection begins (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

The Alsek Ranges ecosection is a cold coast-transition climatic region extending west and south from the O'Connor River. Sub-zones in this area described by Ketchison (1989) and Pojar (1991), include wet cold boreal (BWBSwc) and wet cold sub-alpine (SWBwc) areas, previously not described. These biogeoclimatic sub-zones are found nowhere else in British Columbia, although they are similar to parts of south central Alaska. The boreal white and black spruce subzone is found in floodplains and riparian areas, while the spruce-willow-birch zone is characterized by open coniferous forests with scrub birch and willow common in the shrub layer. Shrubs often dominate in valley bottoms due to cold air drainage. The mountain hemlock zone (MH) has steep rocky slopes with deep snow, while the alpine tundra (AT) is rugged and sparsely vegetated with icefields and high mountains (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

The Icefield Ranges Ecoregion has two biogeoclimatic zones, the forested spruce-willow-birch zone (SWB) in valley bottoms, and alpine tundra (AT) in rugged mountains with poor vegetation cover and extensive icefields (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

2.3.3. Regional Landscapes And Special Features

The Alsek-Tatshenshini River and Mount Fairweather area is within the St. Elias Mountains regional landscape identified by B.C. Parks (Ministry of Parks, 1990). The distinctive characteristics of this landscape are a combination of climate type, major hydrological themes, physiography, biogeoclimatic zones and ecoregions some of which are described above. B.C. Parks summarizes this composite regional landscape in the following way:

Summary of B.C. Parks Description: Landscape #59: St. Elias Mountains

Extremely rugged, heavily glaciated mountains are surrounding a complex of wide low relief valleys with plateau-like upland surfaces;

Climate: Northern Mountain Transition/North Central Interior; Coastal/sub-arctic Montane Mix

Hydrological Themes: large braided rivers, icefields

Physiography: extremely mountainous, Alsek Ranges, Icefield Ranges, Fairweather Ranges

Biogeoclimatic Zones: AT, SWB,

Ecoregion: Tatshenshini Basin, Icefield Ranges, Alsek Ranges Ecosection

Representation of These Ecoregions

There is no representation of this landscape in B.C. parkland (Ministry of Parks classification, 1990). The Haines Highway area also lies in the regional landscape not represented by parklands now. No other regional landscape in the province could supply similar characteristics for representation in a provincial park. Representation means that a balanced sample of the spectrum and patterns of environmental characteristics is contained within a park area. Ideally, a park area must encompass a reasonable sample of topographic variety, the full elevational range, and a balanced selection of solar aspects, drainage and other large scale variations that govern the occurrence of floral and faunal patterns.

Kluane National Park Reserve in Natural Region 6 as defined by the Canadian Parks Service, and Glacier Bay National Park do not necessarily meet national landscape representation goals for the region. The unusual transitional biogeoclimatic conditions at the confluence of the Tatshenshini and Alsek Rivers (Alsek Ranges Ecosection) are not represented in either park. This landscape, with its characteristic vegetation, wildlife and climate is not found anywhere else in Canada, nor is it protected in the United States.

Special Features

Special features are defined by B.C. Parks as a separate goal category for park system planning purposes. Features of provincial to international significance are designated "Outstanding" and features of regional to provincial significance are designated "Important" (Ministry of Parks, 1990). The Tatshenshini River, Haines Highway corridor, Mt. Fairweather, and Tarr Inlet, and Turnback Canyon, all within the study area, have been ranked as "Outstanding" in the B.C. Parks special features inventory. Special feature categories in the study area, some qualifying as "Outstanding" and "Important" include:

B.C. Parks Special Features Categories in Study Area:

Topographic Features: Regionally significant patterns in topography

Surficial Features: U-shaped Valleys, Hanging Valleys, Moraine and Till, Striations, Roche Moutonnee, Cirques, Tarns, Nunataks

Glacio-Fluvial Features: Glacial Outwash, Kame and Kettle, Raised Beaches, Meltwater Channels

Fluvial Features: Floodplains, Fan, Canyon, Hoodoo
Colluvial Features: Talus and Scree, Landslide, Soil Creep, Avalanche Tract
Eeolian Features: Loess, Dunes
Glacial Features: Ice Field, Glacier, Active Ice Erosion/Deposit

Aquatic and Hydrologic Features: Rivers and Streams, Waterfalls and Rapids
Marine Littoral Features: Estuaries, Intertidal Flats

Vegetation Features: Alpine, Subalpine, Mature Forest, Successional Vegetation
Fish and Wildlife Features: Special Habitats, Species systems, Sensitive Species

Cultural Features: Archaeological Sites and Routes, Historic Sites and Routes, Legend Sites, Modern Cultural Features

2.4 HYDROLOGY & WATER QUALITY

Regional Context

Hydrology and water quality affect wilderness in two ways: by influencing dynamic aquatic life systems and animals that depend on aquatic resources; and by influencing wilderness recreation patterns and enjoyment.

Most of the northern Coast Range is a watershed divide, where smaller rivers and streams less than 50km long flow directly into the Pacific Ocean. Rivers on the east side of the range flow into major interior river systems. The Alsek is one of a few rivers that eroded through the Coast Range while the mountains were forming. In Canada, the Stikine and Taku are comparable rivers, while in Alaska, the Copper River to the west was also able to erode through the range.

The Tatshenshini and Alsek Rivers found their way through one of the highest parts of the Coast Range, including Mt. Fairweather, at 4,663m (15,300ft). Today, this means that the rivers provide a travel corridor through a wide variety of environments.

Hydrological information on the Haines Highway area, such as the Klehini or Kelsall rivers was not reviewed for this study.

Flow Rates, Precipitation, Water Quality

The Tatshenshini-Alsek river drainages are both fed mostly by glacial meltwaters. The upper reaches of the Tatshenshini and Alsek Rivers are generally clearer than the lower turbid waters. Most creeks are heavily loaded with sediments. Both major rivers are prone to rapid fluctuations in discharge, with water known to rise more than 1 metre over a 24-hour period. Maximum flows are in June and July, with low flows in late August and September. Flow rates are controlled by glacier and snowmelt.

The Tatshenshini River above Tats Creek (also known as Janwu Heeni, meaning "mountain sheep creek", as named by the late elder Jimmy Kane) has a drainage area of 4,980km^2. Low flows in March are 18.2 m^3/s to a high of 375 m^3/s in July. Two hundred year instantaneous floods are estimated to be about 2,116 m 3/s and ten year seven day low flow about 6.9 m^3/s (Geddes Resources, 1990). The Alsek River starts at the confluence of the Kaskawalsh and Dezadeash Rivers. The Alsek River at the international boundary has drainage area of 27,200km^2. Low flows of 94.6m^3 occur in March to a high of 2360 m^3/s in July. The 200 year instantaneous flood was estimated to be 4270m^3/s and ten year seven day low about 39.2 m^3/s (according to Geddes Resources, 1990).

Streams are typically large in size or contain extensive glaciated areas. Most streams carry high concentrations of suspended solids during high flow periods, but much lower levels in the remainder of the year. A few smaller streams, not fed by glaciers, have much lower levels of suspended sediments. Sediments contain metal levels typical of other British Columbia rivers, except Tats/Janu Heeni Creek, which has high copper levels (according to Geddes Resources, 1990). Potable water is available at creek mouths in the upper sections of both major rivers, but below Sediments Creek on the Tatshenshini River, quiet creekside channels or gravel flat pools provide the only water free of sediments.

Western tributaries are partially glaciated and their hydrologic characteristics are similar to Sediments or Tats/Janwu Heeni Creek. The eastern tributaries, such as Low Fog Creek, are mostly unglaciated watersheds and experience different flow rates than the glaciated watersheds.

Precipitation in the Tatshenshini River watershed varies from 500mm in the upper reaches to 2000mm near coast (Geddes Resources, 1990). Summer water temperature ranges between 4.4C and 6.6C.

2.5 GEOLOGY AND TERRAIN FEATURES

2.5.1 Geology

Context

"Geological and land features are evidence of the historical forces that shaped the evolution of living organisms and can provide insight into past environments (Juday, 1987)." Because of this, geological features are related to biological diversity, and in turn to the wilderness characteristics of the Tatshenshini-Alsek area. Geological information on mineral occurrences in the region is available, but little has been written on the links between geology and ecology, nor any special geological features of general interest. No record of paleontology work was found in the literature review for this report. Geological mapping at a scale of 1:125,000 was completed by the Geological Survey of Canada (Campbell and Dodds, 1979). (See also Map #5 in Appendix showing mountain ranges described here.)

Faults and Earthquakes

Holland (1972) says this region has "some of the most rugged country in North America." The geological and tectonic history of the region is complex and not well understood. It is part of the western margin of North America formed by the impact and accretion of a series of oceanic crustal plates (Parks Canada, 1985). These blocks, called "terranes", are usually separated by fault zones, showing discontinuities in geologic age. The study area is within the fault-bounded Alexander Terrane of the Cordilleran Insular Belt (Geddes Resources, 1990).

The Tatshenshini-Alsek Rivers lie in a region of high tectonic activity, with two major fault systems, the Fairweather and Hubbard/Boarder Faults to the west and the Denali Fault to the east and north (Horner, 1989). These faults, trending northwest-southeast, relate to coastal plate interaction. Slippage along the faults causes the earthquakes. According to Geddes Resources (1990) there is a 40% chance of a force 4 earthquake within the next 50 years along one of these fault lines, although there may not be consensus on this prediction.

The so-called Yukutat Gap, about 150km off the Alaska coast is the centre of one of the most powerful geologic forces on the planet, and the region has registered some of the biggest earthquakes in history. Historic earthquakes have changed drainage patterns or may have affected micro-climates and in turn vegetation communities and diversity in the region.

Mountain Ranges

The study area lies in the Coast Mountains, dominated by the St. Elias Mountains. The Alsek and other ranges of the upper Tatshenshini rise to between 1,900 and 2,600m, marked by sharply serrated peaks developed from cirque action. The Fairweather and Icefield Ranges to the west are the highest in the region, with Mt. Fairweather the highest peak in British Columbia at 4,663m. The Tatshenshini-Alsek Rivers rise in the geologically older and eroded mountains of British Columbia and the Yukon, then flow through the core of the Coast Range to the coast of Alaska. (See also place and feature names on Map #5 in the Appendix.)

The upper Tatshenshini River geology is composed of Paleozoic period sedimentary rocks, while the lower Tatshenshini and Alsek valleys evolved in the Triassic and Jurassic periods of granitic intrusions (Holland, 1976; Farley, 1979).

All of the landforms in the area, such as river valleys, have been extensively modified by previous ice movement. The entire region is still heavily glaciated. Holland (1976) said that "evidence of stagnant and receding ice give the appearance of a land just emerging from its glacial cloak." This youthful landscape contributes to the biodiversity of the region as new habitats are continually created and destroyed by surficial processes.

2.5.2 Geomorphology

The landscape in the study region is a result of a complex series of geologic processes along a tectonic belt (Parks Canada, 1985). Glaciation continues to be the dominant geomorphological force, with the last major deglaciation about 12,000 years ago. Soils are thin and poorly developed. Active mass wasting and periglacial processes continue throughout the region. Streams in the vicinity transport great quantities of eroded material. (See also Map #5 in the Appendix to locate place names described here.)

The region has outstanding examples of geomorphological processes and features, on a scale unmatched elsewhere in British Columbia and rare in Canada south of the 60th parallel. Provincially significant features include the large valley glaciers, such as the Melbern, Tweedsmuir and Grand Pacific Glaciers. These glaciers are several kilometres wide, tens of kilometres long, and hundreds of metres deep. The Lowell Glacier (known as *Naludi* or "fish stop" in Tutchone) area in Kluane National Park has features similar to so-called Alsek Lake on the lower river. Calving glaciers and cold winds from the ice cap create a memorable experience in understanding glaciation.

Surge glaciers, with alternating phases of rapid and slow flow rates are concentrated in the St. Elias Mountains along the Canada-Alaska border. Of the 350 glaciers in the Tatshenshini basin, 31 are likely surge-type glaciers (Geddes Resource, 1990).

Although the Lowell/*Naludi* Glacier is not in British Columbia, the historic damming of the Alsek River by this glacier resulted in downstream flooding events that had a dramatic effect on people and the environment. The last damming and catastrophic flooding occurred between 1848 and 1891, but four other events have been postulated (Parks Canada, 1985). The Tweedsmuir Glacier at Turnback Canyon (in B.C.) has also almost certainly dammed the Alsek River, since the Tweedsmuir is a surge type glacier, and the canyon is narrow. Evidence of the massive erosion caused by the release of an ice-dammed lake can be seen throughout the lower Alsek River, including bedrock scoured by rapid drainage, signs of glacial outwash stripping high on slopes, debris and till piles in the valley, and outwash plains with large ripple marks. The interpretation of these flooding events is of provincial interest, with no other examples as easily accessible.

The river morphology of the lower Tatshenshini and Alsek Rivers is also noteworthy. Classic wide braided channels in a mountainous setting, and the floodplain in the vicinity of the confluence of these rivers is on a scale unmatched in the province.

Many other examples of geomorphological processes are found throughout the study area, many of them visible from the rivers, or from the Haines Highway. Surficial features of regional and local interest include: U-shaped valleys, hanging valleys, moraine and till, striations, trim lines, horns, cirques, tarns, and nunataks. Pleistocene glacio-fluvial features

visible from the rivers include: glacial outwash, kames and kettles, raised beaches, and meltwater channels.

Fluvial features also visible from the rivers include: floodplains, fans, canyons, and hoodoos. The fans in the mid-section of the Tatshenshini are among the best examples in British Columbia. The upper Tatshenshini river has examples of canyons and small hoodoos of local interest. Colluvial features such as talus and scree, landslides, and avalanche tracts are also evident and of local interest.

Eeolian features such as loess are found on the lower Alsek and Tatshenshini, sometimes with dramatic effect as travellers often find themselves in windblown dust and sand squalls. Sand dunes beside the Alsek River in Kluane National Park support nationally rare plant species. It is unknown if these plants occur in the B.C. portion of the river.

2.5.3 Terrain Materials and Soils

Terrain Materials

Terrain materials in the study area were mapped at a scale of 1:250,000 by B.C. Environment (1990). Surficial materials are complex, formed mainly by glacial, fluvial, and gravitational processes. The surficial materials in river valley floodplains, alluvial fans and river terraces are characterized by fluvial sediments, made up of gravels, sands and silts. Moraine and till, consisting of clay, silt, sand and rock fragments are found on lower valley slopes and in U-shaped creek valleys. These sediments were deposited during the Fraser Glaciation, and have not been modified by running water.

Glacio-fluvial sediments, transported by meltwater streams during the last glaciation, are found at the terminus and along the margins of large valley glaciers. Colluvium is the dominant surficial material on steep slopes and at the foot of slopes. Colluvium includes materials such as talus and scree. Permanent ice and bedrock materials cover a large portion of the study area.

Organic sediments at all elevations generally consist of peat on wet, poorly drained sites. Discontinuous alpine permafrost occurrences would be expected in the region, particularly on north-facing slopes at higher latitudes, and associated with poorly drained organic sediments.

Soils

The Coast Mountains of British Columbia have podzolic soils, with a leached A horizon (Fairly, 1979). Podzolic soils are generally well-drained soils. Recent surveys, however, have not found these types of soils in the study area, since they require moist conditions and relatively mild temperatures (Geddes, 1990).

The recent age of surficial materials means that soils have limited profile development. At higher elevations, soil development is retarded by snow cover and low year round temperatures. Acid soils are common throughout this area. Detailed soil information is only available for the proposed Windy Craggy project area (Geddes Resources, 1990). Douglas, (1980) carried out soil surveys in similar adjacent lands in the Yukon Territory.

Regosols, soils in the initial stages of development with a minor accumulation of organic matter and an A horizon would generally be expected in the alpine and sub-alpine parts of the study area. Cryosols (associated with permafrost) would also be expected in the alpine area, while Brunisols would be found in valley bottoms. Brunisols have a deeper soil profile, a

B horizon, and develop under forest vegetation in wetter climatic conditions. Pockets of better developed Podzolic soils may exist in the western part of the region. Bogs, peatlands and organic soils are present, as shown on the 1:250,000 scale mapping by B.C. Environment (1990).

In the Tats Lake area, poorly developed Dystric Brunisols are present in the sub-alpine elevations and Orthic Regosols are found on glacio-fluvial deposits. Orthic Humic Regosols are found on moderately sloping stable outwash fans and Sombric Brunisols on morainal deposits. Organic soils are widespread on the north shore of Tats Lake. Soil nutrients for plant growth are very low (Geddes Resources, 1990).

2.6 VEGETATION

Vegetation is a key natural resource affecting many aspects of wilderness, including biodiversity, wildlife habitat and populations, scenic quality, tourism and recreation. Knowledge of the vegetation resources in the region is sketchy, although the few studies completed have revealed several rare species, as well as unusual plant communities critical to wildlife populations. (See also Map #2 in Section 2.3.1 showing ecoregions and biogeoclimatic zones.)

In 1983, the Royal British Columbia Museum collected plants in the Tats Lake area (Pavlick, pers. comm.), and in 1990 the Ministry of Environment carried out a reconnaissance survey in the Tatshenshini-Alsek Rivers area (Pojar, pers. comm.) Vegetation surveys have been carried out in the Shakwak Valley (DPW, 1977) and Kluane National Park (Environment Canada, Parks 1987 and Douglas, 1981). A thorough inventory of species in the lower Tatshenshini and Alsek Rivers, or in the region as a whole, has not been conducted. Douglas (1992) has compiled a list of 30 rare plant species in the study region, on record at the B.C. Conservation Data Centre. Related mapping to date has been limited to 1:500,000 biogeoclimatic zone mapping and 1:250,000 scale terrain and ungulate capability mapping (B.C. Environment, 1990) The relationship between vegetation communities and wildlife in the lower Tatshenshini-Alsek area is not well understood. (See also sections on biogeoclimatic zones and wildlife habitat).

Two key factors contribute to the known vegetation diversity in the greater region: a convergence of biomes; and geomorphological processes. Douglas (1980) found that plants in Kluane had affinities with boreal, cordillera, northern prairies, and arctic biomes and Yukon/Alaska endemics. Climatic variations in Kluane have produced regional phases of similar vegetation communities. The Kluane vegetation is described as complex, diverse, and unexplained, an apt synopsis for the Tatshenshini-Alsek study region.

Vegetation in the study region is also the product of a youthful landscape, with surficial processes creating new habitats. In these conditions plant succession is often interrupted by changes in habitat, for example by landslides, flooding or avalanches. Greater species diversity is the result. The study area also has plants from many different geographic regions. The wetter conditions of the lower Alsek are different from the rest of the region, likely resulting in as yet not described further species diversity and possible rare or unusual plants.

2.6.1 Tatshenshini- Alsek Area

The regional vegetation patterns are diverse with numerous community types. This variability is the result of climatic and topographic differences in the region, as well as the recent glacial history (Geddes Resources, 1990). Vegetation zones in the Tatshenshini-Alsek area include

boreal white and black spruce (BWBS), spruce-willow-birch (SWB), and alpine tundra (AT) (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

The upper and mid-Tatshenshini River valley bottom has open forest and scrub, with balsam poplar common on floodplains and lower slopes (Pojar, 1991). These extensive poplar stands are noteworthy as an unusual forest type, dominated by an understory of slide alder and a forest floor carpeted with "northern" ground cone (Boschniakia rossica) (Pojar, 1991). Ground cone is provincially rare and is an important grizzly bear food on these floodplain sites. The seral vegetation found on riverbars includes willows, alder, buffaloberry (Shepherdia canadensis), dryas, and hedysarum. Buffaloberry and hedysarum, occurring together on open gravelly floodplains, are an important food for grizzly bears. This habitat is highly visible to river travellers.

Extensive alluvial gravel bars and exposed till support willow-dryas communities. The sloping alluvial fans on the middle part of the Tatshenshini River are carpeted with dryas. The scale of these dryas meadows, while not unique to the area, is uncommon in the province, and rarely as easily accessible. Sloping fens occur on toe slopes. Pojar (1991, pers. comm.) suggests that the periglacial environment at low elevations provides an excellent opportunity to observe primary succession.

Douglas (1980) described the Alsek River area in Kluane in three zones: montane (to 1,100m); sub-alpine (to 1,500m); and alpine (above 1,500m). These vertical zones are further modified by microclimatic conditions, such as slope or aspect. White spruce forest dominates the valley bottoms, with patches of marsh, fen and shrub vegetation. The sub-alpine zone is characterized by tall willow shrubs and scattered white spruce. Alpine communities include willow-birch-heather shrub mosaics at the lower elevations and dwarf vascular plants in the tundra zone (Parks Canada, 1985). Douglas (1980) indicated that the alpine zone was very diverse and complex, in turn related to a high variety of wildlife. Although the areas studied lie north of British Columbia, and conditions in the lower Alsek are wetter, some inferences or at least comparisons may be made in the northernmost part of the study area, and in the drier eastern portion.

The Alsek River valley vegetation above the Tweedsmuir Glacier is reported to be dense and similar to coastal conditions found near the confluence and downstream (Mackenzie, pers. comm.). Douglas (1980) confirms that the sub-alpine zones in the lower Alsek in Kluane have lush herbaceous meadows dominated by species of coastal and mountain floristic affiliations. Below the Tweedsmuir Glacier a mature deciduous forest grows on a kame and kettle plateau near the outlet of the Vern Ritchie glacier (Mackenzie, pers. comm.). This unusual forest has not been explained but may be similar to the "drowned forest" at the toe of the Klutlan Glacier just north of Kluane National Park (author's speculation only).

White spruce, paper birch, willows, and to a lesser extent trembling aspen are found on valley slopes. Conifers are absent on the B.C. portion of the Alsek River above its confluence with the Tatshenshini River (Pojar, 1991). Higher valley slopes and mountains are mainly covered by shrubby vegetation, with willows and slide alder dominating. Moist meadows are common, and support large patches of fireweed and species eaten by grizzly bears (Pojar, 1991). This elevation zone also supports drier meadows.

Alpine tundra vegetation (1500-1700m) in the drier region is consistent with what would be expected including willows, dryas, festuca, lichens and many other species. On exposed ridgetops, cushion plant tundra species are found. Alpine tundra in the moist transitional climate region supports different species (Pojar, 1991).

The study area supports an "unusual number of rare or otherwise phytogeographically interesting species (Pojar, 1991)". Of the 600 rare vascular species in British Columbia, 45 are known to occur in the Haines Triangle. Pojar (1991) found 10 truly rare species on his reconnaissance survey, and notes that there are likely many more to be found. These included Boschniakia rossica, Salix setchelliana, Primula cuneifolia ssp. saxifragifolia, Oxytropis jordalii, Polemonium boreale, Oxytropis huddelsonii, and Carex membranacea, to name a few.

The 1983 Royal British Columbia Museum expedition to Tats Lake resulted in 572 collections, although some species were collected several times in different sectors of the study (Pavlick, pers. comm.). Pavlick notes six known rare species in the sub-alpine-alpine zones including Castilleja hyperborea Pennell, Primula arcticus L. subsp. saxifragifolia (Lehm.), Juncus triglumis L., Rubus arcticus L. subsp. stellatus, Saussurea americana D.C. Eaton, and Potentilla hypartica Malte. Four additional collected species may be candidates for rare status.

Douglas (1980) found several rare and unusual plants in the Yukon portion of the Alsek River valley, but no research has been done to see if any of these species occur in the study area. Douglas hypothesizes that isolated populations of species are the result of post-glacial dispersion of species from areas not glaciated (refugia). Some plants may have survived high on nunataks during the last ice-age. Douglas also points out that parts of Kluane were dominated by grassland until about 3,000 years ago, when spruce forests emerged.

Carex sabulosa, growing on dunes and beach terraces on the Alsek River in Kluane, is an Asian species known to occur at only one other place in North America, at Carcross in the Yukon. It may originate from the period when the Bering land bridge allowed animals to migrate to North America. It is not known whether this species grows in the British Columbia part of the Alsek River.

It is not known whether other unusual or rare plants found in the Kluane portion of the lower Alsek River are found in the British Columbia part of the river. These include, Goats Beard (Aruncus sylvester) on gravel bars; Rice-root Lily (Fritillaria camschatcensis) and Northern geranium (Geranium erianthum) in sub-alpine meadows; Montia parviflora, considered rare in Canada; Oplopananx horridum, a western cordilleran species reported only from the Haines Road; and Holly Fern, (Polystuchum lonchites), in lush sub-alpine meadows of lower Alsek, found elsewhere only in the Selwyn Mountains.

2.6.2 Haines Highway Area

The lower Klehini and Kelsall River areas lie in the Alsek Ranges Ecosection with wetter coastal western hemlock biogeoclimatic subzones (CWHb) and mountain hemlock zones (MH) at the lower elevations (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990). Lower elevation vegetation in the Haines Highway area includes coastal sitka spruce, coastal western hemlock, interior boreal white spruce, quaking aspen, balsam poplar, black spruce and paper birch (Thurber, 1977).

The greatest vegetation diversity of the Haines corridor is in the B.C. section (Mossop, 1974). The increased moisture available because of the coastal influence has allowed coastal, coastal sub-alpine, and north coast alpine vegetation communities to thrive. In turn this has resulted in greater wildlife diversity and productivity, as well as rare and unusual plant and animal species. Some of the flora in this area is unique in B.C., and is of biogeographical interest in the provincial context (Foster, 1979, in B.C. Parks files, Prince George). Plants and animals immigrated into the area from the Alaskan refugium after the Vachon Ice-Age.

The northern part of the Haines Road area lies in the Tatshenshini Basin Ecoregion, mainly in the alpine tundra zone (AT), although the headwaters of the Tatshenshini River lie in the spruce-willow birch zone, where willow and slide alder are more abundant than forest (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990). Weeden (1960), suggests that the poorly drained valley floor combined with cold air drainage from nearby glaciers created the marshy tundra of the flats. Scattered trees survive only on lower mountain slopes on the best growing sites. Mixed communities of dwarf willows, dwarf birch, shrubby cinquefoil and a variety of herbaceous plants create a diverse habitat suitable for a wide variety of birds.

Lower mountain slopes above the valley floor of Chilkat Pass support a "dense vegetation and varied flora", consisting of tall willows, alder and birch (Weeden, 1960). In the alpine areas, heaths, dwarf willows, lichens, mosses and other plants are found in a variety of combinations. The vegetation diversity combined with accessibility has resulted in highly visible and varied wildlife habitat.

2.6.3 Tarr Inlet

Little study has been done in this area, but oceanic tundra has been noted in the uplands around the Melbern Glacier (Pojar, 1991, pers. comm.) Tarr Inlet and the Melberne Glacier are in the Alsek Ranges Ecosection, strongly influenced by coastal conditions. Biophysical data from Glacier Bay National Park may provide further clues on vegetation associations in this coastal area.

2.7 WILDLIFE HABITAT AND POPULATIONS

2.7.1 Regional Overview

Wildlife habitat and populations contribute to wilderness values as part of the intact ecosystem and natural biodiversity. Wildlife species are highly valued for their consumptive and non-consumptive wilderness recreation and subsistence uses. Wildlife viewing opportunities are a particularly important wilderness value in the Haines Triangle, comparing favourably with other viewing opportunities in British Columbia. Our understanding of wildlife habitat, habitat use, and species occurrence and populations in the study area is generally poor. Even so, the wildlife habitat and certain species of the region have been assessed as provincially and nationally significant (Fuhr and Edie, 1991).

Detailed baseline wildlife studies have not been undertaken in the region, but 1:250,000 scale ungulate capability mapping supports some of the information available. The Royal British Columbia Museum has conducted trips to collect and inventory species in the study region since the mid 1950s. In 1983, the Museum collected mammal and avifauna species along the Haines Road and the lower Tatshenshini-Alsek Rivers area (Nagorsen, pers. comm.). Several rare and unusual species were noted. The data is available in computer print-out format, with full descriptions and assessment not yet completed.

Wildlife studies have also been completed in relation to the proposed Windy Craggy mine and road development, and in Kluane National Park Reserve (Geddes Resources, 1990, Parks Canada, 1985). Weeden (1960) carried out a study of birds in the Chilkat Pass area, ptarmigan have been extensively studied along the Haines Road, and the first records of the tundra shrew in the province were noted by Nagorsen and Jones (1981). Many studies have been of a reconnaissance nature, for example work done to assess the environmental impacts of the Shakwak Highway upgrading (Department of Public Works, 1977). Higher profile

species, such as Dall's sheep are better known, but our knowledge of small mammals, invertebrates, and other groups of species is sketchy or nonexistent. Very little is known about the ecological interrelationships between mammals and vegetation, critical habitats, or predator-prey links.

The diversity of landforms, climate and vegetation have in turn produced a variety of biological niches and an unusual diversity of wildlife species. As with vegetation, species of different environmental affiliations reach the limits of their ranges in the study region, for example Dall's sheep. Species of the boreal forest, such as moose and black bear are found as well as those of the high mountains, such as Dall's sheep, mountain goats and grizzly bear. The coastal influence on the lower Alsek has created conditions suitable for the so-called blue glacier bear, considered a race of the black bear (Ursus americanus), as well as Alaskan brown bear. The Alaskan brown bear that is known to move into Canada in the lower Alsek area, is a race of grizzly bear (Ursus arctos). Taken together, this mixing of biomes has resulted in an unusual diversity not duplicated elsewhere in the province.

Many species of mammals, birds, and invertebrates inhabit the region. Only a few species that have been studied or are particularly important are described here. Those species that depend on wilderness habitat for survival are the most important indicators from a wilderness perspective. For example, the grizzly bear is often perceived as a measure of the "health" of wilderness, and this region is one of the last strongholds of the grizzly in North America according to Parks Canada (1985). Another key wilderness indicator species is the harlequin duck which breeds in the study area, prefers remote settings, requires fast running clear streams for breeding, and is intolerant of human disturbance (Redenbach, pers. comm.). Wilderness-dependent and wilderness-associated species contribute to the biodiversity of the region. What is not known about wildlife is far more important than what is known, since the habitat found in parts of the study area is not found anywhere else in Canada.

About 40 typical northern interior mammal species inhabit the region. These include red fox, beaver, coyote, marten, weasel, mink, hoary marmot, porcupine, snowshoe hare, muskrat, lynx, wolverine, coyote, arctic ground squirrels, bats, shrews, mice, voles, lemmings, ptarmigan, golden and bald eagles (other large mammals and bird species are listed below). The larger rodents are important food sources for raptors, furbearers, and grizzly bears. Rodent populations in Kluane are considered diverse because some species are at the northern and southern limits of their range (Parks Canada, 1985) It is not known whether a similar diversity exists in the study area.

Amphibians expected in the region include the western toad (Bufo boreas). Reptiles are not found this far north in the province. Virtually nothing is known about benthic, littoral or terrestrial invertebrates in the region.

2.7.2 Wildlife Habitat and Biogeoclimatic zones

(Refer also to Map #2 in Section 2.3.1 showing biogeoclimatic zones)

Unusual habitat (that is known) occurs near the Tatshenshini-Alsek confluence and along the Haines corridor. The entire region is provincially important as wildlife habitat, since the ecosystem is largely intact. Other watersheds in British Columbia may also be largely pristine, but none in this ecosection with these habitat characteristics. The species and habitat associations described below list only prominent or notable species for each biogeoclimatic zone.

Tatshenshini Basin Ecoregion

The boreal white and black spruce (BWBSe) subzone supports wildlife habitat on floodplains, coniferous forest and lakes. Grizzly bear, black(glacier) bear and Wandering Tattler are found on floodplains, Northern Shrike and Bray-cheeked Thrush in coniferous forest, and Red-throated Loon, Arctic Tern, Least Sandpiper and Semi-palmated Plover at lakes. Wetlands are home to the Short-billed Dowitcher, while moose habitat is found in sidehill shrubland (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

The spruce-willow-birch zone (SWB) supports Dall's sheep, gyrfalcon and ptarmigan on windswept ridges, while moose, Hudsonian Godwit, Brewer's Sparrow, and tundra shrew are found in willow-birch shrubland. Lakes support Red-throated Loon, Arctic Tern, Least Sandpiper and Semipalmated Plover.

The alpine tundra zone (AT) habitat has Dall's sheep, mountain goat, Gyrfalcon, ptarmigan, Golden Eagle, Snow Bunting, and Smith's Longspur. Grizzly bear use the alpine meadows while the rare collared pika prefer talus slopes (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

Alsek Ranges Ecosection

Important habitat in the boreal white and black spruce subzone (BWBS) includes floodplains, wetlands and riparian areas, supporting grizzly bear, black(glacier) bear, moose and Bald Eagle. The spruce-willow-birch zone has young seral forest, and willow-birch shrublands providing habitat for moose, while the mountain hemlock zone (MH) supports mountain goat on rugged southerly aspects and grizzly bear in avalanche tracks. Lower elevation alpine tundra (AT) in rugged areas is habitat for mountain goats (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

Icefield Ranges Ecoregion

The forested spruce-willow-birch zone of valley bottoms has shrublands supporting willow ptarmigan, Smith's Longspur and Tree Sparrow, while southerly aspect subalpine grasslands and rugged terrain support mountain goat. The alpine tundra (AT) in this ecoregion is sparsely vegetated, but provides habitat for ptarmigan and Snow Bunting (Fenger, Lea, Fuhr, Demarchi, Pojar et al, 1990).

2.7.3 Wildlife in the Tatshenshini-Alsek River Area

Large Mammals

Grizzly Bears and Alaskan Brown Bear

The grizzly bear habitat type found in the lower Tatshenshini-Alsek area does not occur anywhere else in British Columbia (Fuhr and Edie, 1991). This floodplain grizzly bear habitat which is the best in the study area is broad, braided, and sparsely treed (Fuhr and Edie, 1991). Grizzly bears use these areas frequently, feeding on hedysarum roots, buffaloberry berries, and fish. This habitat had more bear food on mesic sites than anywhere else in B.C. as observed by the researchers (Fuhr and Edie, 1991). Wildlife biologists estimate that the Alsek Ranges Ecosystem has a bear food productivity that is unique in Canada (Fuhr and Edie, 1991).

Grizzly bear density estimates in the Alsek Ranges ecosection are high for the lower elevation sites, which is thought to be an underestimation, since there is extensive very high capability habitat (Fuhr and Edie, 1991). Close to 100 bears are estimated to inhabit the Tatshenshini-lower Alsek area (Shultze, 1989). The bears are visible for viewing, but also susceptible to disturbance.

Higher elevation sites in the Alsek Ranges area also support habitat with abundant bear foods in large openings with forbs, grasses and shrubs. The lower alpine tundra in this ecosection has abundant berries. Grizzly bear use is confirmed, but the better bear habitats are at lower elevations. Tats Creek (also known as Janwu Heeni, or mountain sheep creek, as named by the late elder, Jimmy Kane) is one of the best tributary creeks for grizzly bears, with denning sites located along its south aspect.

In the drier parts of the Tatshenshini and Alsek valleys, grizzly bear habitat is typical of other northern interior areas in both B.C. and the Yukon. Floodplain and moist aspen sites have the best grizzly bear habitat, while wide dry valleys with birch and willow, and the alpine tundra areas have a lower bear food abundance.

Grizzly bear density in the Tatshenshini Basin and Icefield Ranges is medium and low, typical of other northern B.C. regions (Fuhr and Edie, 1991). Seasonal movement patterns for the bears follow the sequence of plant growth and the availability of salmon. In spring they use valley bottom new growth, moving upland as the snowline recedes. In July hedysarum roots are utilized on valley bottoms, followed by the use of berries ripening in the uplands. In the fall, the bears move down to take advantage of salmon as well as hedysarum roots (according to Geddes Resources, 1990).

Alaska brown bear/kodiak bear (also Ursus arctos) on seasonal rounds are thought to move into the B.C. portion of the lower Alsek River valley. The floodplain habitat of the lower Alsek River used by these bears is not found anywhere else in the province.

Black Bears and the "Blue" or "Glacier" Bear
Black bears occur throughout the study area, visible on the river floodplain or seasonally in sub-alpine forests or alpine tundra. Banfie (1974) refers to the blue or glacier bear (Ursus americanus emmonsii), considered a colour phase of the black bear. The numerical status and range of these animals is unknown, although they are thought to be rare in Alaska, possibly limited to the lower Alsek area. This race of the black bear is found nowhere else in B.C. or Canada.

Ungulates

Dall's Sheep (Thinhorn Sheep), Mountain Goats and Moose
The northwestern region supports British Columbia's only Dall's sheep population. This species is a sub-species of the North American thinhorn sheep. About 200 of the 400 estimated Dall's sheep in B.C. have their summer and winter range in the study area. Aerial surveys by Geddes Resources indicate the total number in the study area at between 200 and 350 animals. The remainder are east of the Haines Highway. The main Dall's sheep winter range is located in the Squaw Range and areas to the south. The Squaw Range supports over 100 sheep, with other important areas including the Upper Parton, Datlasaka Range, Noisy Range, Tats Creek (also known as Janwu Heeni, mountain sheep creek, as named by the late elder, Jimmy Kane) and Mt. Mansfield area.

Mountain goats are probably the most populous ungulate in the study area. Goats are abundant on south facing aspects of the upper Tatshenshini River, mainly between Sediments

and O'Connor Creek, and also along the O'Connor River, in the canyon. About 300 mountain goats are estimated to inhabit the study area, not including the Haines corridor (Shultze, 1989). Geddes Resources (1990) estimated the number at 400. A separate isolated herd of 36 goats has been observed on the east side of the Melberne Glacier near Tarr Inlet (Murtha, pers. comm.) It is not known whether this herd was included in previous population estimates. Mountain goats are recognized as a wilderness species since they are sensitive to human disturbance (Parks Canada, 1985).

Moose occupy valley areas in moderate concentrations relative to other areas in British Columbia. The species in the study area are the large Alaska-Yukon form (Alces alces gigas)

Small Mammals

Small mammal species were collected by the Royal British Columbia Museum in the Tats Lake and lower Tatshenshini River area in 1983. These collections, and observations by others, indicate that species in the area include: red fox, beaver, coyote, marten, weasel, mink, hoary marmot, porcupine, snowshoe hare, muskrat, lynx, wolverine, coyote, arctic ground squirrels, hare, beaver, bats, shrews, mice, voles, and lemmings. (This list is not exhaustive.)

During the 1983 expedition the most common small mammals in the Shini Creek vicinity were the Deer Mouse and Northern Red-backed Vole. Sub-alpine habitat supported Masked Shrew, Dusky Shrew, Tundra Vole, Long-tailed Vole, and Western Jumping Mouse. Collared Pikas and Bushy-tailed Woodrats were also found in the alpine areas above Shini Creek (Nagorsen, 1985). The Museum records indicate habitat affinity and the reproductive biology of these species.

Avifauna

The region, including the upper Tatshenshini River and Haines corridor, supports 180 bird species (Hoefs, 1973). The lower Alsek River supports 139 bird species, mainly associated with the aquatic environment (Alsek River Draft Management Plan, 1988). The Alsek delta is an important foraging area, breeding site, and migratory staging area.

The delta is a spring staging area for thousands of sea ducks, waterfowl, loons, cormorants and gulls. Terns and gulls rest and nest on the exposed gravel flats of Dry Bay during low spring water. The Alsek River is a migration route to the interior Yukon lake district and perhaps to the Mackenzie Delta, for a variety of waterfowl, Thayer's Gulls, herring gulls, parasitic jaegers, and possibly northern phalaropes moving to the interior (Patten, 1981). In the autumn, sandhill cranes fly over the coastal mountains, up the Alsek River valley, then south toward the Stikine River (Patten, 1981). The main wave of bird migration passes through in April, then again in September and October. Arctic and Aleutian terns are known to nest on one of the Alsek Rivers gravel bars.

At the mouth of the east Alsek River, thousands of bald eagles, glaucous-winged gulls, kittiwakes and mew gulls feed on the eulachon, a small species of anadromous fish (Patten, 1981). Eagles follow the coho salmon, and move up the main Alsek River to the Klukshu River in late autumn. Resident eagles, that remain along the lower Alsek in summer are known to eat gull chicks, since fish are scarce.

The Royal British Columbia Museum conducted a survey on the lower Tatshenshini River, recording several species unusual to B.C., for example the king eider and Stellar's eider (Campbell et al, 1983). Other notable birds in the study area include peregrine falcon, osprey,

bald eagle, northern goshawk, golden eagle, northern harrier, trumpeter swan, willow ptarmigan, great grey owl and short-eared owl. During the 1983 work in the Tats Lake area, a Brewer's sparrow nest was found in sub-alpine habitat, the first such nest found north of the Okanagan in B.C. Other breeding birds included, "the water pipit, white-tailed ptarmigan and golden-crowned sparrow form the alpine zone; the least sandpiper, lesser yellowlegs, and semipalmated sandpiper from the subalpine zone; and the fox sparrow and hermit thrush in spruce forest (Nagorsen,1985). The Hudsonian godwit and wandering tattler breed in the area and are also noteworthy. Trumpeter swans have been sited in several of the small lakes in the region. Gyrfalcons are the main raptor of interest in study area, active on the west side of the Squaw Range. Harlequin ducks found in the study region are an indicator of wilderness quality since they prefer remote breeding sites free of human disturbance.

Theberge (1974), conducted a survey of breeding birds in Kluane, recording 106 nesting species. He found that "species diversity, while lower than in much of southern Canada is perhaps higher in the southwest Yukon than any place north of the 60th parallel". This is because species from many different biomes meet here. Coastal, boreal forest and alpine species can all be seen in one day. Theberge found that the most abundant breeding songbirds in Kluane were slate-colored junco, myrtle warbler, Swainson's thrush, Wilson's warbler and gray jay. The most diverse habitats with the greatest bird densities were found to be in poplar and willow communities, decreasing by the time spruce forest is attained.

2.7.4 Wildlife in the Haines Highway Area

The British Columbia portion of the Haines Road corridor is unusually productive because of increased moisture in this sub-alpine and alpine environment, in comparison to other interior areas (Department of Public Works, 1977). Unusual bird diversity has been recorded, including rare or unusual breeding species such as Smith's longspur and snow bunting (Weeden, 1960). Weeden recorded 82 bird species in the Chilkat Pass area. Species such as red-throated loon, gyrfalcon, and wandering tattler are more characteristic of arctic tundra. This habitat also supports one of the few places in B.C. where three species of ptarmigan occur together. Willow Ptarmigan can be seen in the shrub tundra right beside the road (Department of Public Works, 1979). Mammals such as the collared pika, tundra vole and the meadow jumping mouse are also of interest in this area, while the Tundra Shrew occurs nowhere else in the province (Foster, 1979). Nagorsen and Jones (1981) collected the only tundra shrew found in the province along the Haines Road, extending the range of this species 500km south of its previously known limits.

According to the environmental assessment completed for highway upgrading, the corridor supports a large moose population, along with Dall's sheep, often visible from the highway (Department of Public Works, 1979). Dall's sheep favour the south and west aspect grass-forb slopes facing the highway. The Mt. Mansfield area, once proposed as an Ecological Reserve, is a mineral lick and maternity area for Dall's' Sheep. Some of the best alpine and sub-alpine habitat for red fox, gray wolves, and grizzly bears also occur in this wetter B.C. part of the corridor. Grizzly bear densities in river valleys are not as high as the lower Tatshenshini-Alsek area, but the spawning salmon in rivers such as the Blanchard and Klukshu attract bears from July to September. Mountain goats frequent the mineral lick at Kwatini Creek, and are also seen near Mt. Glave and the Three Guardsmen.

Other species in the upper Tatshenshini/Haines Highway area include black bear, beaver, coyote, golden eagle, goshawk, spruce grouse, and various species of waterfowl. The spruce forest habitat in the northern part of the corridor also supports marten and red squirrels, with burned sites suitable for snowshoe hare, coyote, ruffed grouse and sharp-tail grouse. Larger, clear streams support mergansers and kingfishers.

Gyrfalcons and peregrine falcons are residents of the Chilkat Pass. Falcons have been collected by falconers for many years (B.C. Parks files, Prince George). Tull (1979), found that the golden eagle was the most common raptor nesting in the area, with peregrine falcons, osprey and rough-legged hawks more rare.

2.7.5 Chilkat Eagle Preserve

The Chilkat Eagle Preserve lies just outside the study area near the coast of Alaska, on the Chilkat River. The Chilkat River valley in southeast Alaska, just south of the Haines summit supports the largest concentration of bald eagles yet found in North America and the world (Hansen, et al, 1984).

The eagles may gather outside the provincial boundary, but they arrive from throughout the coasts and interior parts of Alaska, B.C. and Washington. Eagles from the entire northwestern range congregate in the Chilkat River area (State of the Preserve Report, 1992). The Klehini River drains from B.C. into the Chilkat River near Klukwan at the eagle "council grounds". The eagles gather in the Chilkoot and Chilkat valleys when spawning anadromous fish provide abundant food. In the fall, during the chum salmon run, eagle numbers reach 3,000-3,600 eagles (Hansen, at al, 1984). From October through January, between 50,000 and 200,000 chum salmon spawn in these rivers (State of the Preserve Report, 1992) Winter food shortages mean that most eagles leave the area and disperse north and south. In spring, some eagles nest in the breeding territories located in the Chilkat valley. Research shows that the eagles depend on environmental features to maximize food intake, minimize energy output and minimize injury (Hansen et al, 1984).

2.8 FISH HABITAT AND POPULATIONS

Fish and pristine aquatic habitat are a vital part of the dynamic wilderness ecosystem in the Tatshenshini-Alsek region. Recreational and subsistence fishing also contribute to wilderness values. The distribution, abundance, and life history of fish under provincial jurisdiction is not well understood. About 22 fish species are reported in the general surrounding area according to Peden (pers. comm.), while this report refers to 11 species described in the literature and by anecdotal references. Further research in the region may reveal further species occurrence.

The Tatshenshini-Alsek River fishery is the only Pacific salmon fishery accessible by road in the Yukon. Along the northern Pacific coast, the Alsek is classified as one of three major salmon bearing rivers, the two others being the Taku and Stikine Rivers. Geddes Resources, 1990). Salmon species in the Alsek River system in order of abundance include sockeye, chinook, coho, chum, pink and steelhead trout. Minor salmon species, that do not travel far up the river system, include pink and chum salmon. Migration was blocked on the Alsek River either by Turnback Canyon or more likely by the Lowell Glacier advance sometime during the last 200 years. This velocity barrier may not exist now. Elders of the Champagne-Aishihik First nations recall adult salmon migrating upstream of Turnback Canyon and Lowell Glacier. Evidence that anadromous sockeye may have existed in the upper Alsek River lies in the Kokanee population in the Kathleen and Frederick lake systems.

Resident freshwater fish habitat is found in many of the tributary creeks throughout the study area. Other fish species found in the rivers, lakes and streams of the study area include rainbow trout, slimy sculpin, burbot, common whitefish, lake trout, arctic grayling and dolly varden.

The Tatshenshini River contributes 95% of the chinook salmon, 90% of the sockeye salmon and 75% of the coho salmon to the commercial fishery at the river mouth (Geddes Resources, 1990). Most of the sockeye and chinook salmon spawn in Canada, in the headwaters of the Tatshenshini River. The upper Tatshenshini, Klukshu, Blanchard, Takhanne Lofog, Goat and Village drainages collectively are the most significant fish bearing streams. All small clear-water tributaries and side channels near the mouth of larger tributaries and several lake systems are juvenile rearing habitat for chinook and sockeye salmon. Examples of this habitat include the outlets of Parton River, O'Connor River and Tats/Janwu Heeni Creek (Geddes Resources, 1990). Salmon have also been observed spawning in side channels and in areas of upwelling water in the main stem of the Tatshenshini River. Several lakes are important fish habitat including Klukshu, Neskataheen and Blanchard lakes.

Although most of the Salmon production originates further upstream in Canada, some of the coho salmon production occurs in streams on the west side of Dry Bay in Alaska (Draft Alsek River Management Plan, 1988). Fuhr (1991, pers. comm.) reports that main channel spawning of salmon occurs on the lower Tatshenshini-Alsek Rivers, with high fisheries values in spite of high sediments. Clear water upwells from river bottom gravels create suitable spawning conditions.

Spawning runs for chinook salmon begin in mid-May to late June, with the peak chinook run up the Tatshenshini River in late June to mid-July. Peak migration for coho salmon up the Tatshenshini takes place in mid-September to early-October. Peak migration for sockeye salmon on the Tatshenshini happens in late July to early September. The sockeye run is comprised of two distinct phases, a smaller first run in the summer, followed by a larger second run.

The Chilkat River is adjacent to the study area, but is fed by several tributaries originating in Canada. The Klehini and Kelsall Rivers are the two most important tributaries entering the Chilkat from B.C. Dolly varden have been collected in the Klehini River and from a stream near Chilkat Pass (Peden, pers. comm.). Peden suggests that further "inventories should consider any genetic diversity of populations adapting to unique habitats, especially with such a highly adaptable species as the Dolly Varden". Determinations should be made as to whether the fish are Dolly Varden or the recently described Bull Trout. The Chilkat River is an important salmon bearing river as well as providing habitat for other species. The largest gathering of bald eagles in the world use the river environs, protected in the Chilkat Eagle Preserve, to feed on the salmon. Salmon reach Canadian waters in the Klehini River.

Kelsall Lake to the east of the Haines Highway in a sub-alpine setting, is the only sizable lake in the study area and is reported to have dolly varden fish (Johnston, pers. comm. and Peden, pers. comm.). Round whitefish were reported in Kelsall Lake by the 1983 Royal British Columbia Museum Expedition (Peden, pers. comm.) Slimy sculpin and burbot have been noted in other small lakes, such as Survey Lake west of the Tatshenshini River near Detour Creek (Peden, pers. comm.).

2.9 RARE, THREATENED OR ENDANGERED SPECIES

Several different researchers have identified known and potential rare or unusual wildlife and plant species. in the study area. Some of these are rare to B.C., while others may be rare to Canada. This study does not rigourously classify degrees of rarity, since the existing information is from several different sources using different measures of rarity. Further research is needed to fully establish the significance of known rare and as yet unidentified rare species.

Unusual or rare wildlife species in the study area include: blue glacier bear, Arctic tern, gray-cheeked thrush, lesser gold-plover, Pacific loon, wandering tattler, king eider, and the collared pika (Fuhr and Edie, 1991). Other notable species, such as grizzly bear and Dall's Sheep, are noted in Section 2.7 above. Peden (pers. comm.) observes that a unique species of whitefish was found by C.C. Lindsey in the Yukon portion of the drainage, and that this fact should be realized during further inventory work. Since species occurrence in the area has not been well documented, and this ecoregion occurs nowhere else in the province, the potential for more unusual species is high.

The B.C. Conservation Data Centre does not identify any plant species in the study region as vulnerable to extirpation or extinction at this time. Rare or unusual plant species in the region have been noted by Pavlick (1992), Pojar (1991) and Douglas (1980), but species occurrence and distribution have not been fully researched in the study area. Pojar (1991) noted several "truly rare species" in B.C, including Boschniakia rossica, Salix setchelliana, Primula cuneifolia ssp. saxifragifolia, Oxytropis jordalii, Polemonium boreale, Oxytropis huddelsonii, and Carex membranacea, to name a few. Further rare and possibly rare plants found in adjacent areas are listed above in the vegetation section.

Douglas (1992) lists 30 provincially rare species in the study region, on record at the B.C. Conservation Data Centre. These plants were designated as rare by Douglas, Straley and Meidinger in the *Vascular Plants of British Columbia -1989-1992*. These include, in addition to those listed above: Artemesia alaskana, Astragalus nutzotinensis, Astragalus umbellatus, Carex bicolor, Carex membranacea, Draba glabella var. glabella, Erigeron uniflorus, Euphrasia arctica var. disjuncta, Luzula confusa, Montia bostockii, Oxytropis maydelliana, Oxytropis scammaniana, Oxytropis viscida, Rubus arcticus stellatus, Salix glauca var. acutifolia, Salix setchelliana, Saxifraga serpyllifolia, Selaginella sibirica, Senecio atropurpureus, Senecio ogotorukensis, Senicio sheldonensis, Senecio tundricola, Spirea stevenii and Swertia perennis.

(See also Section 2.6 above).

2.10 BIODIVERSITY

Biodiversity refers to "variety and variability among living organisms and the ecological processes within which they occur (Cordell and Reed, 1990)". Biodiversity is not just a measure of the number of species, but includes genes, communities, ecosystems, landscapes, regions and biomes (Noss, 1990). It has been described as the basic "goods and services of the environment" (Miller, 1990).

In recent years, biodiversity and its relationship to wilderness has received considerable attention in wilderness research and management (Mosquin and McAllister, 1991, Reed, 1990, Freilich, 1988). The IUCN (Resolution No. 18/47, 1990) emphasized the importance of protecting biodiversity and suggested that "diversity, including species and habitat richness, representativeness and scarcity is a fundamental principle" in identifying potential protected areas. The focus of wilderness values, in both the professional and public realm, has shifted from recreational to biological concerns.

Wilderness is now viewed as a "reservoir of biodiversity (Noss, 1990)." Recent literature has addressed questions of how much wilderness is needed to protect biodiversity on an ecoregions basis, and how big a wilderness area must be to sustain biodiversity in an

ecosystem (Peterson et al, 1991, Noss, 1990). Some of the key points in the literature that relate to the existing natural conditions in the Tatshenshini-Alsek region are:

Biodiversity and Wilderness Values in the Study Area:

Big wilderness better represents native biodiversity at more levels of organization than any other kind of protected area (Noss, 1990).

Natural biodiversity is better maintained in wilderness, because vulnerable species as well as less sensitive ones are protected.

The free and dynamic operation of natural processes in wilderness enhances biodiversity, rather than controlling and selecting only a special few that humans hold in high esteem (Cordell and Reed, 1990).

Viable populations of some species are ill-adapted to the human environment; to the extent that a species is dependent on the conditions of wilderness, a reduction in roadless area in a region predisposes it to extinction (Noss, 1990).

Big wilderness maintains entire biological communities, where native species naturally occur in patterns of abundance, and where composition is as important as richness (Noss, 1990).

For native biodiversity at the landscape level of organization, which consists of gradients and mosaics of many community types, big wilderness is the only option. Wilderness and biodiversity need each other (Noss, 1990).

As wilderness areas become smaller, more intensive management is needed to maintain diversity.

Kluane supports an unusual diversity of plants and animals for such a high latitude because species from several different overlapping biomes are found here, some at the northern or southernmost limit of their range (Parks Canada, 1985). Species from boreal forest, arctic tundra, and western cordilleran biomes mix in Kluane, with relects from prairie and even Asian regions surviving previous glaciations (Asian species probably came from the Bering land bridge). The Tatshenshini-Alsek study area is within this region of unusual diversity, but has a greater coastal influence with conditions not found in Kluane.

In the Tatshenshini-Alsek region, enough is known about biodiversity to realize that we understand very little. Biodiversity and wilderness in the Tatshenshini-Alsek region are critical concerns for several reasons:

- the ecological characteristics of the Alsek Ranges Ecosection in the region are found nowhere else in British Columbia or Canada,

- the ecological characteristics found in parts of the study region are not protected elsewhere in Canada or the United States,
- the links between biodiversity and wilderness in the study area to the adjacent protected areas of Kluane National Park Reserve, Glacier Bay National Park and Preserve, and the Chilkat Eagle Preserve are not well understood,
- parts of the region are unusually productive due to the biogeoclimatic conditions, but the links between critical habitat, wilderness, and biodiversity are not well understood,
- the rare plants and animals known to exist in the region may be only a portion of the unusual species occurring: it is not known what other rare species may be present,
- there is insufficient habitat, population and ecosystems information on species that depend on wilderness, for example grizzly bears and wolves,
- little is known how development would affect biodiversity in the region.

The review of existing biological information suggests that biodiversity in the study region depends, to an unknown extent, on wilderness. Wilderness-dependent and wilderness-associated wildlife, and intact ecosystems that are represented nowhere else in the province, indicate the importance of biodiversity in this wilderness setting.

2.11 RESEARCH NEEDS

Wildlife habitat and ungulate capability mapping at 1:250,000 scale has been completed for the entire study area (B.C. Environment, 1990). Collections of small mammals, birds and plants have been made in selected parts of the study area. Still, our detailed knowledge on wildlife, fish and vegetation habitat and populations is sketchy at best. Large mammals and avifauna have received the most research attention, particularly in the last decade.

Our understanding of species occurrence, distribution, community structure, and ecosystem dynamics is limited. For example, furbearer, rodent or invertebrate occurrence and distribution are largely unknown. Vegetation communities and species have been noted at specific sites in the region, for example at Tats Lake, along the Haines Highway and Tatshenshini-Alsek Rivers, but these have been reconnaissance studies. Non-vascular plants have not been well studied. Knowledge of the greater part of the study region, in particular the lower Tatshenshini-Alsek Rivers, remains limited.

Aquatic ecology in the study region is poorly understood, yet is particularly important for management and protection purposes. The interaction of Pacific and Yukon River species is unknown. Many of the glaciers in the region are retreating, resulting in changes to stream turbidity. The effect of these changes on aquatic ecosystems is not known.

Natural resource research tasks to collect baseline data, in approximate order of priority are (See also Section 9.0, Summary of Research Needs) :

- determine basic occurrence and distribution of wildlife habitat and populations, ecological interrelationships;

- determine the basic occurrence and distribution of aquatic habitat, species using the habitat, ecological relationships and their significance, both within the aquatic systems and with the surrounding terrestrial habitats;
- determine basic occurrence and distribution of vegetation habitat and populations, including non-vascular plants and ecological interrelationships;
- conduct detailed ecosystems mapping in river corridors;
- identify best habitat for mountain goats;
- conduct basic research on distribution and ecology of known unusual species such as blue glacier bear and the collared pika;
- conduct basic research on grizzly bear habitat and population;
- identify unique geological and geomorphological features in the region;
- assess biodiversity of region in context of habitat, species and ecosystems research;
- classify rare species in the study area;

Analytical or applied research tasks include:

- assess sensitivity of species and ecosystems in the study area to potential developments such as roads or resource developments,
- determine best areas for wildlife viewing;
- determine baseline conditions of popular campsites on rivers;
- determine how well Kluane National Park Reserve represents ecosystems in the region.

3.0 CULTURAL RESOURCES

3.1 INTRODUCTION

Cultural resources and diversity are part of the wilderness mosaic, contributing to a richer appreciation of the natural environment. Few places on the globe have been untouched by human presence, yet we do not always acknowledge that wilderness attributes may be the result of an earlier culture's land management practices.

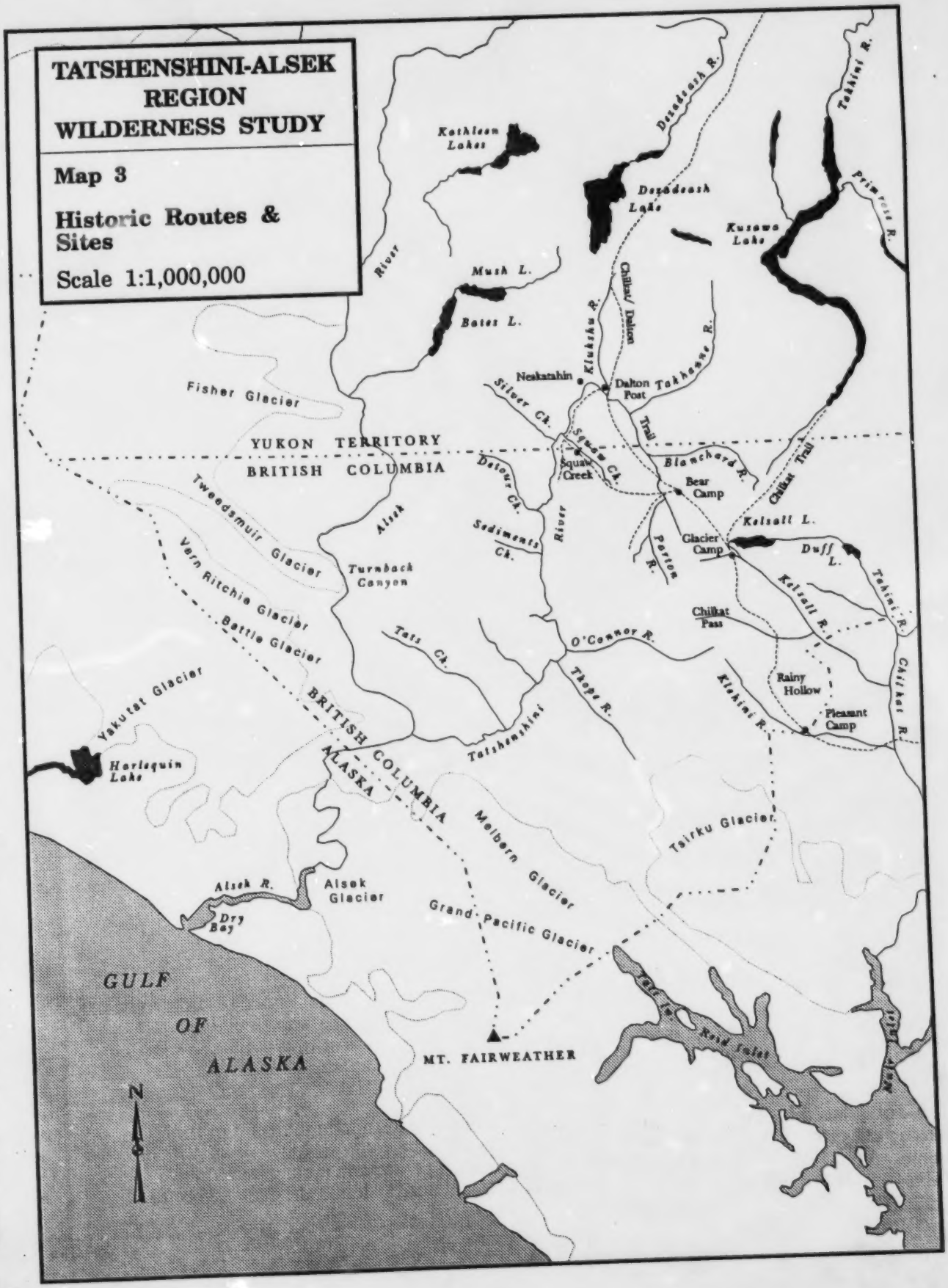
Although today the Tatshenshini-Alsek region is viewed as "empty" wilderness, devoid of human presence, it has not always been this way. In the middle of the nineteenth century there were several aboriginal villages along the Tatshenshini and its tributaries. In fact, there is good reason to believe that the area's salmon rich rivers may have supported the highest aboriginal population density of any part of Yukon or British Columbia north of 59 N latitude. In the last century, the area was a also major aboriginal trade and travel route. People were moving goods up and down these rivers, between the northwest Pacific coast and the Yukon interior, and between the Lynn Canal and Dry Bay sections of the coast, via the Alsek-Tatshenshini Rivers. The area's strategic location and its rich subsistence resource base made it a highly desirable place.

Both archival and ethnographic sources clearly document the intense use and occupation of the Alsek-Tatshenshini area in the last century by the Tlingit and Tutchone ancestors of the Champagne and Aishihik First Nations, whose headquarters are now based in Haines Junction, Yukon and the Tlingit of Yakutat and Dry bay, Alaska. Unfortunately, at present there is a lack of data to confirm if this was the case in prehistoric times; no archaeological work has been done in the wilderness area away from the highway. In the twentieth century, use of the area by the Champagne and Aishihik people has declined for reasons primarily related to government hunting and trapping regulations.

This report section presents a brief overview of the area's rich yet not widely known human history, as documented in the existing archaeological, ethnographic and archival sources. Data gaps and avenues for further research are also outlined. (See also Map #3 showing historic routes and place names).

3.2 PREHISTORY

We do not know when humans first entered the Alsek-Tatshenshini wilderness region. The area has seen little archaeological field research or impact assessment work (See Research Needs, below). Based on archaeological data from adjacent regions such as Kluane and Aishihik Lakes in the Yukon (Workman 1978) and the Alexander Archipelago in southeast Alaska (Davis 1980, Ackerman et al. 1979), people may have been living in this area as early as 8,000 years ago. Around 2500 years ago, the adjacent coastal and interior regions each began to develop their respective cultural patterns. These essentially continued on, with only slight gradual changes, to historic times. Due to a lack of archaeological research and data, it is not known whether the archaeological record for the Tatshenshini-Alsek wilderness area follows the coastal or the interior pattern, or is a mixture of both.


TATSHENSHINI-ALSEK REGION WILDERNESS STUDY
Map 3
Historic Routes & Sites
Scale 1:1,000,000
Kathleen Lakes
Dezadeash R.
Dezadeash Lake
Tahkini R.
Primrose R.
Kusawa Lake
Mush L.
Bates L.
Kluksha R.
Chilkat/ Dalton
Takhanne R.
Neskatahin
Dalton Post
Trail
Silver Ck.
Fisher Glacier
YUKON TERRITORY
BRITISH COLUMBIA
Squaw Ck.
Squaw Creek
Blanchard R.
Chilkat Trail
Bear Camp
Detour Ck.
Alsek
Tweedsmuir Glacier
Sediments Ck.
River
Kelsall L.
Glacier Camp
Perten R.
Duff L.
Vern Ritchie Glacier
Battle Glacier
Turnback Canyon
Tahini R.
Kelsall R.
Chilkat Pass
Tats Ck.
O'Connor R.
Rainy Hollow
Klehini R.
Chilkat R.
Yakutat Glacier
Thope R.
Pleasant Camp
Harlequin Lake
BRITISH COLUMBIA
ALASKA
Talshenshini
Melbern Glacier
Tsirku Glacier
Alsek R.
Alsek Glacier
Dry Bay
Grand Pacific Glacier
GULF OF ALASKA
MT. FAIRWEATHER
Icy Bay
Reid Inlet
N

3.3 ABORIGINAL HISTORY

According to the anthropologist de Laguna (1971:18), stories and place names told by Elders in the Yakutat area in the 1950's suggest that prior to the appearance of European trade ships off the Pacific coast, the entire Alsek-Tatshenshini basin may have been home to people who spoke an Athapaskan language, most likely Tutchone. Little is known about the people who lived in the lower Alsek basin at this time, but there was regular intermarriage and exchange with the Tutchone who lived in the upper part of the river basin. Later, sometime in the 18th century, Tlingit traders from Hoonah and Chilkat country married into the Dry Bay and lower Alsek River people, forming a mixed Tlingit-Athapaskan group know as the Dry Bay tribe (de Laguna 1991:203).

We have a better understanding of the region's people and their lifestyles in the nineteenth century. Both archival and oral history sources indicate that by this time, the Alsek-Tatshenshini wilderness area was home to both Tlingit and Tutchone peoples.

Sometime during the nineteenth century, the Tlingit people known as the Nua Qua moved into the middle reaches of the Tatshenshini basin. At least two Nua Qua settlements are referred to in the region's early archival documents (e.g. Davidson 1901: Glave 1890-91) and oral history sources (Cruikshank et al 1990:203-204: de Laguna 1972:87-89: McClellan 1975:28). These are the settlement of Nuq'aik, located near Debris Creek, and another known as Tin-char-han or Tinx Kayaani which translates as "Kinnikinik leaves', situated further downstream(Cruikshank et al 1990:203: see also De Laguna 1972:89).

The Tutchone were also living on the Tatshenshini at this time. The same archival and oral history sources which refer to the Nua Qua villages also indicate that there were several "Sticks" or "Gunana" villages, terms used by the coastal Tlingit to refer to the Tutchone, along the river at this time as well. The mid-nineteenth century Kohklux map (Davidson 1901) shows the Tutchone village of Neskatahin, located by Village Creek in the Yukon and unnamed "Sticks" settlements near O'Connor River and the mouth of the Tatshenshini. The first non-native explorers in the area, Glave and Dalton, noted three "Sticks" villages along the Tatshenshini in the 1880s: Neskatahin: Klukshu, located on the upper Alsek in what is now the Yukon: and another which they refer to as Alsek. (Glave 1890-91).

There appears to have been close connections between the Tutchone and the Nua Qua people in the nineteenth century: marriages took place between the two groups. The Tutchone likewise were closely connected with the Dry Bay people, who seasonally joined their Tutchone and Tlingit relatives at their fishing villages on the Alsek Tatshenshini. Away from the coast it was easier to dry the fish for storage, and while in the area they were also able to hunt and collect berries (de Laguna 1972:87-89).

Stories recorded from both coastal and interior elders indicate that these nineteenth century trips up and down the Alsek-Tatshenshini sometimes involved portages across or even under glaciers (de Laguna 1972:87-89, McClellan 1975). The Tutchone of the upper Alsek travelled downstream as well to visit their coast relatives. The late Mrs. Kitty Smith, a Champagne and Aishihik elder, made the trip from Neskatahin to Dry Bay as a little girl in the mid 1890s in a dugout canoe (Cruikshank et al 1990:203).

The Tutchone village of Neskatahin was clearly the most famous and important of the nineteenth century Alsek Tatshenshini fishing villages (Glave 1890-91, McClellan 1975, de Laguna 1972.) At that time it was both a regional trading centre and a major seasonal gathering place for Tutchone from as far away as Hutshi and Aishihik: they came here to

catch and dry salmon, which was unavailable in the latter areas. Glave (November 29, 1890, p. 310) described Neskatahin as he saw it in 1890.

> *The village of Naska Ta Heen is the headquarters of the Gunana or Stick Indians. It is composed of a dozen houses, large and small, which in this country means accommodation for a great quantity of people, as several whole families reside in one house...(The houses) are built of heavy planks, hewn into shape with the native adze, the roots either covered with rough heavy shingles or thatched with hemlock bark. They are all fitted with a large opening in the centre of the roof as an escapefor smoke.* (Glave, November 29, 1900, p.310).

The Tutchone also gathered at Neskatahin to trade; here they exchabged the furs they had trapped in the previous months with the coastal Chilkats.

Throughout the nineteenth century, and likely in earlier times as well, large parties of coastal Indians used to travel to Neskatahin, other Tatshenshini fishing villages and other rendezvous points in the Yukon interior to trade with the Tutchone and their neighbours. Several different routes were used by the Chilkat Tlingit from the Klukwan area to reach Tutchone country in the mid to late nineteenth century (Davidson, 1901). One of the more easterly of the Chilkat's routes went by Kusawa Lake and Hutshi and on the Yukon River (Krause 1956, Ned, 1984). A more westerly route went via the Kelsall and Tatshenshini Rivers to Neskatahin, and from there on to Aishihik. The Haines Highway more or less follows this branch of the Chilkat trail (McClellan, 1975). Another route went overland to the middle reaches of the Tatshenshini (Davidson, 1901). Throughout most of the nineteenth century, the Tlingit forbade the Europeans on the coast from using their trading trails or from travelling to places such as Neskatahin, in order to protect their trade monopoly with the Tutchone.

Twice a year, in February and again in early summer, large Chilkat trading parties arrived at Neskatahin, loaded down with bundles of European goods which they exchanged for furs and hides. In earlier times, before the arrival of the Russian and British trading ships on the northwest coast, seaweed, eulachon grease and shells from the coast were exchanged for copper and furs from the interior (McClellan, 1975). The nineteenth century trading involved considerable feasting and celebration. Some Tlingits stayed year round with their interior hosts or trading partners; others married Tutchone women. According to Legros (1984) this aboriginal trade, with its resultant social exchange between the Tlingit and the Tutchone, reached its peak between 1843-1864.

By the time of Glave's visit in 1890, aboriginal activity in the Alsek Tatshenshini had declined significantly from the heyday of a few decades earlier. Southern Tutchone and Tlingit elders have told anthropologists that sometime in the mid-nineteenth century, the people living on the lower Alsek contracted smallpox from the European traders on the coast, and were more or less exterminated (McClellan 1975:28). The Nua Qua people were also badly affected by these epidemics.

Stories still told today by Champagne and Aishihik elders recall a tragic event in which the Tutchone people of the upper river also suffered tremendous population loss in the middle of the last century. A party of Snag Indians from Upper White River came down and massacred the Neskatahin people over a dispute (McClellan 1975:25). Only two parties of the Neskatahin people survived; these are the ancestors of the present day Champagne people. The 200 or more people Glave met along the Alsek-Tatshenshini River in the early 1890s were only a remnant of the area's former large population (Cruikshank 1974:V.11).

The 1880s saw the end of the coastal Tlingit blockade of routes to the interior. With the blockade lifted, in 1896, Jack Dalton, who had accompanied Glave in his earlier explorations

of the Alsek-Tatshenshini, improved the western branch of the Chilkat trail in order to have a route to move goods to the Klondike gold fields. Close to Neskatahin, at the site the Tutchone know as Shaw'ashe, Dalton established a trading post at this time, which he named Dalton Post. Some of the Neskatahin people established cabins at Shaw'ashe; others continued to use Neskatahin as their headquarters.

The Klondike Gold Rush of 1898 brought many changes to the area, as outsiders flooded though Tutchone territory. One of these changes was enforcement of territorial provincial boundaries, which began with the boundary survey of 1899. Government authorities discouraged the Yukon-based Neskatahin Tutchone from hunting and fishing in British Columbia. Thus, most of the land area they had traditionally used was cut off to them (McClellan 1975:26). Around this same time, Dalton Post was closed and a new post opened in 1902 at Champagne. Many Tutchone moved to Champagne at this time since the hunting and fishing territory they could now access from Neskatahin and Shaw'ashe couldn't support them. Klukshu then became, and continues to be, the important summer fish camp for these people. The last of the Nua Qua people joined their relatives and began living at Dalton Post and Champagne around this time.

Use of the Alsek-Tatshenshini area by the Tutchone people in the twentieth century differs significantly from that of earlier times. Only the Yukon portion of the wilderness area has been used for subsistence. Trapping continued until more recently. Changes in the regional economy have also affected their use of the area. Some of the Tutchone began participating in mineral exploration efforts in the Tatshenshini basin. Paddy Duncan a Neskatahin Tutchone, discovered gold on Squaw Creek in 1927.

The construction of the Haines Road and the Alaska Highway in 1942 and 1943 brought further changes to the land use patterns of the Tatshenshini-alsek area. Some Champagne and Aishihik families shifted their base from Champagne to Haines Junction. Once based in the latter settlement, the Haines Road made parts of their old territory more accessible, and once again, families began trapping and hunting in the area. Today the Haines Road area, rather than the river, is the focus of settlement and areas near the road are used extensively for subsistence hunting and fishing. Some Champagne-Aishihik people now provide guided horse trips or other tourist oriented activities in the Tatshenshini-Alsek area.

3.4 EUROPEAN AND EURO-CANADIAN HISTORICAL CHRONOLOGY

This cryptic historical review from the Euro-Canadian perspective focuses on the chronology of events in the study region. It is based on a cursory literature review to complement the aboriginal history described above. More complete references on the Dalton/Chilkat Trail, Dalton Post/Shaw'ashe, the Northwest Mounted Police, and the region's mining history, for example, are available. (See also Map #3.)

European and Euro-Canadian exploration, trading, and development in the Haines Triangle region is mostly limited to the last century, from about 1880 to the present, although the Alsek River was noted by La Perouse in 1786 and Tebenkof in 1849 (Tero, 1973). Russians traded with the coastal Chilkat people in the 18th century and a trading post had been established at the village of Chil'khat by 1813, but the natives denied outsider access to the interior. The Euro-Canadian historical perspective is the story of prospectors, traders, explorers and scientists, sovereignty, defense and resource development.

John Muir and a missionary by the name of S. Hall Young first talked with Chilkat people at the village of Klukwan in 1879. Chief Kohklux of Klukwan drew a now-famous map of the Chilkat route for George Davidson. In 1880 Edmund Bean learned of the Chilkat route to the interior, but the first outsider over the Chilkat Pass was Aurel Krause in 1881. In 1883, Frederick Schwatka of the U.S. Army made the first official exploration of the route to the interior. The original Chilkat Pass route included 48 kilometres of ice-fields. The Chilkat Trail was also travelled by a party supported by Leslie's Illustrated Newspaper in 1890, accompanied by a scout, Jack Dalton. It was Dalton who developed one of the two Chilkat trails as a toll route to the Klondike gold fields during the rush of 1897-1899. Later, in the summer of 1890, E.J. Glave paddled down the Tatshenshini River to the Alsek confluence. Jack Dalton and E.J. Glave visited the village of Neskatahin on the Tatshenshini River on their way to White River country the following year.

In 1897, 18 police officers were sent to enforce the law along the Chilkat Pass route to the goldfields. A detachment was established on the Chilkat/Dalton Trail at the U.S. boundary, and in 1898 the Northwest Mounted Police established the "Dalton House" post near Dalton's trading camp. Winter patrol cabins were set up at Bear Camp, Glacier Camp and Rainy Hollow. All the Dalton Trail police posts became obsolete after 1903, as attention focussed inland (Parks Canada, 1985).

In 1898, the "Last Chance Mining District" west of Klukshu Lake in what is now Kluane National Park, was the site of a minor gold rush. Eighty claims were staked, but no miners returned to work the claims the following year (Parks Canada, 1985). In 1899, the Porcupine Creek gold rush in the Rainy Hollow vicinity attracted 1,000 prospectors, many coming over the Dalton Trail. This strike was very active until 1906, then wound down in 1916. The Dalton Trail itself fell into disuse in 1905 as mining prospects declined.

The Dalton/Chilkat Trail played a short but important role in the Klondike Gold rush. Although only a small portion of the more than 30,000-50,000 people who crossed the Chilkoot or White Pass trails used the Dalton/Chilkat Trail, the route was much better suited for moving animals. The domestic animals herded over the route were part of the Dawson food supply during the gold rush. The Dalton/Chilkat Trail was also significant as the only successful toll route to the gold fields, the toll sometimes enforced at gunpoint.

In 1897, J.J. McArthur of the Dominion Lands Survey, then J.B. Tyrrell in 1899, of the Geological Survey of Canada, travelled the Dalton Trail separately, describing the geology, landscape and native peoples as well as mapping (Tyrrell, 1899). The International Boundary

Commission and the National Geographic Society mapped the U.S.- Canadian border in the Alsek region in 1908 (Tero, 1973).

W.E. Cockfield conducted geological surveys along the Dalton Trail in 1927-28. Gold was discovered at Squaw Creek in 1927, as noted above, by Paddy Duncan, a Neskatahin native, followed by "a few whites who came in during the 1932 season" (Report to the Minister of Mines, Northwestern District, 1932).

Mount Fairweather was first climbed in 1931 by Alan Carpe. Bradford Washburn explored the St. Elias mountains from Lowell/*Naludi* Glacier to Yakutat Bay in 1935, mapping enroute (Tero, 1973). In 1943 the U.S. Army built the Haines cut-off to the Alcan Highway, opening the route to the public in 1947. The Haines road roughly followed the route of the original Dalton Trail. In 1944, C.H.D. Clarke of the B.C. Lands, Parks and Forests Branch, conducted a biological reconnaissance of lands adjacent to the Alaska Highway (Clarke, 1944). Then, in 1948 the Andover-Harvard Yukon Expedition spent a field season in the southwestern Yukon studying archaeology and natural history (Johnson, 1944). In the 1950s, the Haines to Fairbanks pipeline was built along the Haines Road.

In the 1960s, Dalton Post/Shaw'ashe was used by workers from the nearby Jackpot mine, resulting in increased deterioration to historical resources. The Dalton Post/Shaw'ashe and Neskatahin sites have been vandalized, although a few buildings and a cemetery still remain. Dalton Post/Shaw'ashe is now used for subsistence and sport fishing, camping, and as both an access and egress point for rafters and kayakers paddling the Tatshenshini River. The Dalton/Chilkat Trail route, in the form of the Haines Highway, has become a major tourist route to the Yukon and Alaska. The region as a whole has evolved into an international destination for wilderness recreation and nature appreciation.

3.5 CULTURAL RESOURCES AND RESEARCH NEEDS

At the present time very few heritage or cultural resources have been identified in the Alsek-Tatshenshini area (CHIN sites files, Yukon and B.C.). Except for Klukshu, which is still occupied, and Neskatahin, none of the previously mentioned nineteenth century fishing villages documented in archival and oral history sources have been relocated and documented as heritage sites. The only recorded heritage sites in the area are four lithic scatters (IlVe 1, 2 and 3, and IlVf 1) which were recorded during a highway archaeological impact assessment project in 1980. As well, a petroglyph site has been reported near the confluence of the Tatshenshini and Alsek Rivers confluence the Tatshenshini and Alsek Rivers, but this site has not been recorded. There has only been one archaeological field project in the wilderness area away from the Haines Road. This brief survey effort by Gates and Roback (n.d.) which went only a short distance downstream from Neskatahin before turning back due to difficult travelling conditions. No sites were recorded by this project.

The lack of recorded heritage sites in the wilderness area is best attributed to the limited field research which has been conducted to date. The difficult terrain of the wilderness area has also hindered research efforts here, and the dynamic nature of the environment may be continually destroying heritage sites along the river floodplain.

Further field research within the wilderness area is necessary before any assessment can be given of the area's cultural resources and their significance. Nonetheless, the preceding overview of what is known about the region's human history from the ethnographic (oral history) and archival sources gives every indication that the region likely features a number of significant heritage sites. The various nineteenth century Tatshenshini fishing villages mentioned in the archival and ethnographic sources need to be relocated and assessed. Quite

likely there are also other petroglyph sites in the wilderness area. These heritage site locations need to be ground truthed.

There is a rich body of oral history and archival sources which should be researched and integrated. These sources include aboriginal toponyms and traditional stories about landscape features, glacial surges, travel under the glaciers, the flooding of Dry Bay and trading festivities. These need to be collected and synthesized so that the rich human history of the Tatshenshini-Alsek area can be told.

The research recommendations are:

- Conduct reconnaissance level assessment of potential archaeological sites on the Tatshenshini-Alsek Rivers. Assess the condition and vulnerability of known archaeological sites. Follow-up reconnaissance work with detailed assessments as identified. Recommend a management strategy.

- Identify potential archaeological sites in the remainder of the region, particularly along the Chilkat\Dalton Trail route, or other known native trade and travel routes, for example on tributaries of the Tatshenshini River. Conduct reconnaissance inventory of potential archaeological resources.

- Conduct oral history work with the Champagne-Aishihik First Nations as part of archaeological, historical and other cultural research in the region. Document toponyms and legend sites as part of this research.

- Conduct an historical resources inventory and assessment of the region, including along the Tatshenshini-Alsek Rivers, Chilkat\Dalton Trail route, Dalton Post/Shaw'ashe, and old mining camps throughout the region. Recommend a management strategy.

4.0 VISUAL RESOURCES

4.1 VISUAL RESOURCE MEASUREMENT

The recognition that scenic values are distinct and measurable resources originates in North America with the preservation movement of the late 19th century. Yosemite and Yellowstone National Parks in the United States, for example, were established to preserve distinctive landscapes. The U.S. Forest Service contributed much of the early literature on applied visual assessment techniques during the 1960s and 70s but many of the principles are still applied today (Litton, 1968). This work was based on the premise that the public places a value on wild or rural landscapes, and that visual resource management could contribute to the quality of the observer's experience.

The U.S. Forest Service methodology, versions of which are now in wide use, relied on established thinking about human perception of beauty and aesthetic quality, linking formal design principles to visual resource management. This approach to visual resource management is now viewed as the *professional paradigm*, where the landscape is described in physical and aesthetic design terms with assigned values on the basis of such descriptions (Zube, 1986). Visual assessment techniques, known as *behavioural*, draw on the discipline of psychology to measure observer perceptions about the landscape. While the approach is more rigorous than the professional paradigm and has greater statistical validity, it is costly and is more difficult to link to management issues.

The basic premise of the so-called *professional* visual assessment technique is that landscape character is definable by its intrinsic forms, lines, colours and textures. Contrast, repetition and sequence further help to define visual features, as do weather, light and season. In the Tatshenshini-Alsek River or Haines Highway setting, the visible landscape is often perceived from a raft or vehicle, moving at variable speeds. This dynamic view of the landscape affects the visibility of man-made change since the duration of views varies, as does the observer position and distance from the visual features, such as mountains. All of these factors affect the perception of landscape character.

The visual assessment literature shows clearly that natural (eg. forest fires) or man-made (eg. transmission towers) changes affect peoples appreciation of the landscape (B.C. Ministry of Forests 1981). In general, people prefer natural landscapes to those modified by man, yet the literature also shows that perceptions may be influenced by economic factors, cultural background, or other human variables such as emotion or intellect (Andrews, 1979, B.C. Ministry of Forests, 1981).

Accepted methodologies (for example, in British Columbia) for visual resource assessment use these basic visual perception premises to help classify landscapes.

Visual resource assessments:

- show the distribution of scenic values and landscape quality,
- show the ability of landscapes to absorb visual impacts,
- identify visually sensitive locations,
- assess existing viewing opportunities,
- predict adverse visual impacts, assess mitigation measures,
- provide a means to manage visual resources in various biogeoclimatic zones.

Accepted concepts and definitions in visual resource assessment which are used in this report include:

Viewshed (or "viewscape")
A viewshed includes all of the landscape seen from a point or corridor such as a river.

Viewshadow
The viewshadow is any area within the broader viewshed that is not visible from a particular point. For example, travelling downriver on the Tatshenshini, north facing slopes of mountains would be visible travelling downstream, but in the viewshadow when looking back upstream.

Visual Sensitivity
Visual sensitivity is defined as the degree to which any portion of the landscape is sensitive to, or liable to be visually changed by man-made developments.

Visibility
The literature defines foreground, mid-ground and background according to the distance of the viewer from the object. The foreground is cited as 0-.40km from the observer, middleground as .40-1.0km, and background as 5-8km from the observer. High visibility is defined as 0-1.5km, moderate visibility from 1.5-3.0km and low visibility as 3.0-5.0km (USDA, Forest Service, 1974). These visibility criteria vary according to landscape and atmospheric conditions.

Visual Absorption Capacity (VAC)
VAC is the physical capacity of a landscape to screen proposed changes and still maintain its inherent visual character. More complex landscapes, for example with variable vegetation patterns, may have more ability to visually absorb development and still maintain visual quality. This measure is most valid on a site specific basis and is difficult to apply to an entire region.

4.2 VISUAL RESOURCES AND WILDERNESS

Visual resources are a key part of wilderness values. Undisturbed viewsheds, whether they are flat wetlands or dramatic mountain ranges contribute to the wilderness qualities of an area. An increase in the evidence of recent human activity decreases the *wilderness* scenic quality. Culturally modified landscapes can be very scenic, but they may no longer have the attributes contributing to wilderness values. Yet historically modified landscapes may be managed for wilderness values, for example in the American southwest where Anazazi ruins are seen in wilderness parks. North American cultural biases have tended to preclude aboriginal inhabitation or land uses in designated wilderness, but this perception is changing, at least in the Canadian north. Emerging knowledge of past native landscape modification practices such as burning to change wildlife or plant habitat is changing the Euro-Canadian view of wilderness landscapes. The perception of scenic quality in wilderness depends on the viewer's cultural background. Given these limitations, this study rates the visual resources of the Tatshenshini-Alsek region.

Viewsheds in wilderness settings are most vulnerable to the first human disturbance, since the change contrasts the most with wilderness qualities sought by many recreationists. Subsequent changes may have an incremental negative impact on scenic quality, but the wilderness character may be reduced most after the first impact.

4.3 VISUAL RESOURCES IN THE STUDY AREA

Previous Work

The Tatshenshini and Alsek valley viewsheds were described by J.S. Peepre and Associates (1986), focussing on key viewpoints, visual features and viewshed sensitivity. The B.C. Forest Service landscape assessment methodology was applied in conjunction with the B.C. Parks Outdoor Recreation Classification system (Ministry of Forests, 1981, Block and Hignett, 1982). The Ministry of Environment has also produced a visual resource assessment guide linking physiographic regions with visual resource management (Yeomans, 1983).

Regional Visual Resources

The visual resources in the region are largely intact, in a scenic and rugged mountainous setting, parts of which are unmatched in the province. Three main accessible viewsheds shape the scenic quality of the study area: the Tatshenshini River, Alsek River and Haines Highway corridor. Other icefield and glaciated areas, such as along the Melbern Glacier and Tweedsmuir Glacier, or in the heart of the Alsek Ranges, provide some of the most rugged and spectacular viewsheds or visual features in the region, accessible to recreationists seeking a remote backcountry experience. Mt. Fairweather is an outstanding feature visible from many points in the study area. (See also Map #5 in the Appendix showing many of the features described here.)

Tatshenshini River

The Tatshenshini valley is marked by distinctive visual characteristics that change several times from the headwaters to the Alsek confluence. Alpine tundra and open sub-alpine forest views change to confined canyon sections, opening to broad U-shaped forested valley views. In the mid- to lower Tatshenshini, the viewshed is marked by sawtooth mountain ridges and large alluvial fans. Alpine ridges allow views to the St. Elias Range.

Below the O'Connor River the viewshed changes character again, opening to a wide braided river, with expansive views to the St. Elias mountains. The Canadian portion of the visual crescendo climaxes at the Alsek River confluence, with views of the Melbern Glacier and Noisy Range set in one the most expansive braided river confluences in the province.

Alsek River

The Alsek River valley viewshed in the B.C. portion is different from the changing qualities of the Tatshenshini viewshed. The lower Alsek viewshed is marked by scattered forest, alpine tundra and rock in a broad braided river valley flanked by valley glaciers. This viewshed is aptly described as "emerging from a glacial cloak" (Holland, 1976).

The upper Alsek River extends into Kluane National Park. The scenic quality in the vicinity of the large valley glaciers such as the Lowell (Lowell is known as *Naludi*, meaning "fish-stop" in Tutchone), matches the grandeur of Alsek Lake (local name) further downstream. Mt. Kennedy, Alverstone and Hubbard in the ice-cap region rise above the calving glacier with its kilometres of ice-cliffs. The Tweedsmuir Glacier is visible from well upstream. Turnback Canyon and the Tweedsmuir Glacier are the visual highlights of the lower Alsek valley, before the river is joined by the Tatshenshini. Below the Tatshenshini confluence, the Alsek River viewshed is marked by lush coastal vegetation on lower slopes, and views of numerous hanging glaciers.

Haines Highway and Beyond

The Haines Highway viewshed is distinctive in the province. By definition, the highway is not in itself part of the wilderness resource, but the views from the highway include wilderness lands in the study area. Most visitors would perceive themselves as "in the wilderness." No other highway route in B.C. provides the same transition from coastal forest, through sub-alpine forest to expansive alpine tundra views.

The Melbern Glacier, Tweedsmuir Glacier and Mt. Fairweather, while not seen by most residents of B.C., are outstanding visual features. Mt. Fairweather is seen by river travellers, as well as by recreationists in the White Pass area far to the east. As the highest mountain in the province, it is a provincially significant landmark.

4.4 VISUAL RESOURCE RATINGS

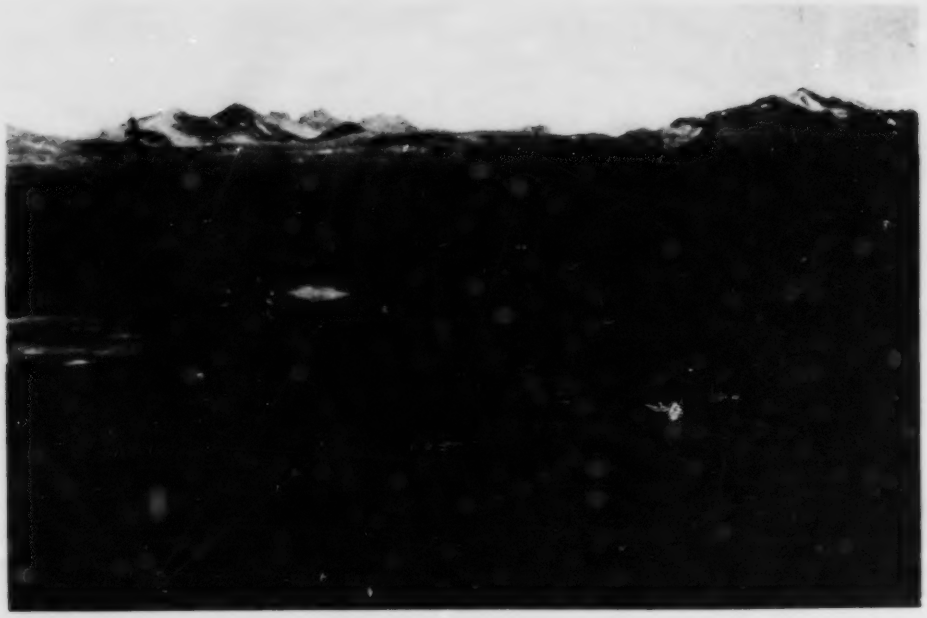
Much of the Tatshenshini and Alsek River valleys are rated as highly sensitive to disturbance as seen from the rivers (J. S. Peepre and Associates, 1986). This visual sensitivity is due to steep forested valley slopes, prominent focal views, and the broad braided floodplain which allows an expansive viewshed to be seen from the river. The slopes along the river corridors have a low visual absorption capacity. Once on the alpine ridges, the viewer can look in any direction from anywhere west of the Haines Highway and not see any evidence of roads or development (with the exception of Windy Craggy, and the U.S.-Canada boundary cutline).

The Haines Highway and the Shakwak Valley, as a major tourist route to the Yukon and Alaska, has many more visitors than the Tatshenshini-Alsek valleys. As a touring route, scenic quality is an important resource. Visual sensitivity in the highway corridor is high due to the open alpine and sub-alpine vegetation. Change in the natural setting would be noticeable. For the same reason, visual absorption capacity of the slopes adjacent to the highway is low. The highway itself, since it has been re-built, was well-designed to complement the scenic beauty of the route.

Using the Ministry of Environment assessment methods, the region achieves the highest ratings for scenic quality, on a scale of one to five (Yeomans, 1983). Scenic quality with this method is based on the diversity and contrast of landforms, vegetation, water, colour, scarcity and cultural modifications (U.S. Bureau of Land Management, 1980). The regional viewsheds score 4 or 5 out of a possible 5 on each of the six criteria tested.

4.5 RESEARCH NEEDS

No further visual resource information is required to define wilderness values. Further applied visual impact research is recommended if roads or other developments are proposed or approved. Visual resource impact assessments should be based on a GIS system using terrain modelling techniques.



Upper Tatshenshini River valley and Haines Road area. Tundra vegetation on the valley floor, with spruce and willow communities on slopes. Datlaska Range in background. (J. Peepre)

Upper Tatshenshini River canyon in the Boreal White/Black Spruce zone. Swift waters and rapids to Class III and IV mark the upper river. (J. Peepre)

Rafting party camped at "Alsek" Lake on the lower Alsek River. These gravel campsites are resilient to use, and are seasonally below the high water mark. (M. Murtha)

The lower Alsek River passes through the Coast Range with vistas of dozens of glaciers. Salmon spawn on shallow gravel bars in the main channel of the Tatshenshini and Alsek rivers. (J. Peepre)

5.0 RECREATION AND TOURISM

5.1 DEFINITIONS AND METHODS

Wilderness recreation has been synonymous with the wilderness idea since the late 19th century. People in wilderness have been researched and managed intensively for decades. It is only recently that our attention has focussed more closely on the natural resources inherent in wilderness, for example on biodiversity. Wilderness tourism has existed since the first wilderness parks were established more than a hundred years ago, but wilderness as a tourism resource has been rediscovered with a new emphasis on adventure and interpretation.

While recreation and tourism may differ according to which definition is used, the wilderness activities related to both are essentially the same. In this report recreation and tourism are divided into two sections. The recreation section addresses the inherent recreation features and existing uses in the region. The tourism section assesses in more detail those resources and recreation activities that attract or have the potential to attract visitors to the region. For the purposes of this report, the tourism section focuses on guided recreation activities, and the associated tourism benefits to nearby communities.

This division into two categories facilitates the use of various methodologies used by different provincial ministries. For example, B.C. Parks assesses recreation features, biophysical limitations and activity opportunities; the Ministry of Forests use features and the Recreation Opportunity Spectrum to assess recreation; and the Ministry of Tourism uses a composite tourism capability and tourism product approach. When viewed together, the various approaches provide a comprehensive assessment of wilderness recreation and tourism values.

All of the methodologies used today address cultural resources as part of the recreation features, but fall short of acknowledging that activities considered as recreation by some are subsistence to others. For example, a berry patch may appear as a recreational feature of low significance, but in fact may be an important food harvesting site. The distinction between recreation and lifestyle is unclear in these circumstances.

5.2 RECREATION FEATURES, CAPABILITY AND SIGNIFICANCE

The Tatshenshini-Alsek Rivers and the Haines Highway area are identified as two of B.C. Parks outstanding backcountry adventure recreation areas, not represented in the parks system now (Ministry of Parks, 1990). Such backcountry areas may not always be needed for landscape representation, but B.C. parks indicates that if recreation values are outstanding, they should be considered for addition to the parks system.

The Haines Highway area is identified by B.C. Parks as a high capability backcountry recreation area because of easy access to extensive alpine areas, mountain and glacier viewing, Dall's sheep, bird diversity, hiking, wildlife viewing, skiing, snowmobiling and hunting (Ministry of Parks, 1990).

5.2.1 Recreation Features

Recreation features in the Tatshenshini-Alsek River valleys have been assessed by B.C. Parks (J.S. Peepre and Associates, 1986). A second recreation features inventory was carried out for the Haines corridor including lands further to the east of the highway (Juan de Fuca

Environmental Consultants, 1986). Assessment results were mapped at 1:50,000 scale, with a summary report identifying the key recreation feature attributes. The recreation features mapping by Peepre (1986) was completed in conjunction with a visual resource assessment and visual sensitivity mapping.

The 1986 study found a very high number of nationally and provincially significant recreation features according to criteria established by B.C. Parks (Block and Hignett, 1982). See also Section 8.4 in this report, which compares the Tatshenshini-Alsek Rivers to three other north coast rivers. Feature significance is rated as follows:

Recreation Feature Classification (after B.C. Parks)

Very High Feature Significance

These features have very high ability to attract recreational use, could be of national significance

High Feature Significance

These features have high ability to attract recreational use, could be of provincial significance.

Moderate Feature Significance

These features have moderate ability to attract recreational use, could be of regional significance.

Low Feature Significance

These features have low ability to attract recreational use, but have a natural attractivity that is common throughout the map area.

Very Low Feature Significance

These features have very low ability to attract recreational use, with no features which stand out, but they may have an ability to attract specialized recreation uses.

The 1986 study divided the Tatshenshini and Alsek Rivers into landscape units with common recreation feature attributes, presented in table form in the original report. The wilderness recreation significance of the Tatshenshini-Alsek region is in part a composite of all the recreation features. Although not all of the individual landforms and other features in the region are nationally or internationally significant, the report found that taken together, these features are uncommon in the rest of Canada, and in some cases not found elsewhere.

Recreation feature coding and justification is described in the original report. The highlights of the 1986 findings supplemented by new information are summarized in Table 1:

TABLE 1: RECREATION FEATURE SUMMARY

(See also Map #5 in Appendix showing many of the places described here)

Tatshenshini River Headwaters

- regionally significant alpine environment,
- regionally significant kayaking, canoeing and rafting on a small low-volume river,
- regionally significant cultural heritage features near Blanchard River,
- moderate wilderness recreation values,

Tatshenshini River Upper Canyon,

- territorially significant kayaking, canoeing and rafting opportunities on moderate volume whitewater river,
- deepest and most continuous canyon of the Tatshenshini River,

Dalton Post/Shaw'ashe and Neskatahin

- territorially significant historic and native heritage site,
- territorially significant sport fishing and subsistence fishing,
- territorially significant as access/egress point for boating

Tatshenshini River Lower canyon

- territorially significant whitewater kayaking/rafting in canyon wilderness setting,

Squaw Range to Carmine Mtn.: Mid-section of the Tatshenshini River

- Quiet Canyon is regionally significant landforms that adds diversity to river trip,
- Detour, Sediments and other creek alluvial fans are provincially significant features because of their scale, scenic beauty; they are landform highlights of the upper river with recreation value due to scenic quality, camping opportunities, and provision of access to side valleys,
- serrated mountain ranges flanking the river are regionally significant features,
- large mammals of national significance,

O'Connor Creek to Lower Tatshenshini River

- river morphology and nearby landforms are regionally and provincially significant, with high scenic quality,
- nearby alpine meadows are regionally significant, providing attractive hiking,
- large mammals of national significance,
- provincially and nationally significant ecological characteristics, in themselves of recreation interest

Tatshenshini at Alsek Confluence to Gateway Knob (in U.S.)
Alsek River from Turnback Canyon to Tatshenshini Confluence

- nationally significant scenic beauty and diversity,
- nationally significant river morphology and glacial features and processes such as the Melbern Glacier and Battle Glacier,
- outstanding examples of glaciers descending to navigable river, eg. Netland and Melbern Glaciers,
- numerous regionally significant hanging glaciers,
- provincially significant Noisy Range and other ranges such as the icefield Ranges are representative examples of St. Elias Mountains,

Tatshenshini-Alsek confluence area cont'd.

- St. Elias Mountains as a whole are nationally significant recreation feature,
- Alaskan portion nationally significant to U.S., and is protected by National Park,
- provincially significant cultural heritage features,
- nationally significant viewing of large mammals,
- provincially and nationally significant ecological characteristics, in themselves of recreation interest

Alsek River estuary and Dry Bay (in U.S.)

- nationally significant landforms protected in Glacier Bay National Park and Preserve,
- nationally significant estuary and wildlife values,

Turnback Canyon on Alsek River

- Turnback Canyon is a nationally significant landform and whitewater river section,
- regionally significant granite canyons are deep and colourful,
- Tweedsmuir Glacier, glacial processes on this scale are provincially significant,
- regionally significant moraines, smaller valley glaciers,
- locally significant waterfalls cascade into the river,

Range Creek area on Alsek River

- large mammals of national significance,
- regionally significant whitewater boating,
- provincially significant scenic values,

Windy Craggy Area (Noisy Range)

- regionally significant landforms, wildlife and vegetation,
- ecological characteristics may be provincially significant, but with local recreation significance,

Upper Alsek River

- this section not in study area, but must be mentioned, as it forms an essential part of the recreation experience on the Alsek,
- nationally significant Lowell/*Naludi* Glacier and historic ice-damming,
- glacier calving, ice cliffs regionally significant,

St. Elias Mountains

- Tweedsmuir, Vern Ritchie, Battle Glaciers together are provincially significant as the only representation in the province of the largest non-polar ice-cap in the world,

Mt. Fairweather and Fairweather Ranges

- nationally significant mountaineering objective,
- provincially significant landmark and mountaineering objective since it is highest peak in B.C.,
- provincially significant wilderness mountain range,
- regionally significant border mountains such as Mt. Turner, Mt. Lodge,

Tarr Inlet, Melbern Glacier, Grand Pacific Glacier

- nationally significant landform with historical importance since it has been touted as possibly Canada's only access to saltwater on the northwest coast,
- nationally significant history with its connection to Canada-U.S. boundary issues,
- Melbern and Grand Pacific Glaciers are provincially significant valley features in their own right,

Alsek Ranges

- regionally significant mountains and icefields, much of which has seen little recreation activity yet,

Haines Highway Area

- provincially significant wildlife viewing for Dall's sheep, ptarmigan and many unusual bird species,
- regionally significant mountain ranges west of the Highway, with local skiing, snowmobiling, hiking, hunting and mountaineering,
- provincially significant alpine meadows in corridor area,
- Samuel Glacier area is locally significant for ski touring,
- Nadahini Glacier ice caves locally significant recreation spot,
- Mt. Mansfield area of provincial ecological interest and wildlife viewing,
- Chilkat Pass regionally significant viewscape, wildlife viewing,
- provincially significant, Dalton and Chilkat Trails
- Three Guardsmen are locally significant for hiking and climbing, as well as wildlife viewing,
- distinctive deep canyons locally significant,

5.2.2 Recreation Capability And Significance

The region has outstanding provincially, nationally, and internationally significant capability for dispersed wilderness-dependent recreation. Examples include rafting, mountaineering, wildlife viewing. Conversely, the region has poor capability for concentrated recreation developments such as resorts, developed campgrounds, beach or water play recreation. (See also Section 8.4 which compares the Tatshenshini-Alsek Rivers to three other north coast rivers).

5.2.3 Existing Recreation Access

Access to most of the study area is only possible in summer by air, boat, on foot or horseback. This limited access defines an important part of the wilderness experience: relatively few visitors in a largely undisturbed setting, using mainly non-mechanized transportation. Limited access does not limit the quality of recreation opportunities, since wilderness, in the minds of many of those using it, provides the ultimate recreation experience. Easy roaded access to recreation is a common trait, wilderness accessible only by boat or foot is a rare attribute, destined to be more scarce in the future.

5.2.4 Recreation Opportunity System

The B.C. Forest Service, in addition to using recreation features classification, describes recreation lands according to Recreation Opportunity Spectrum classes. The method identifies recreation opportunities according to the type of recreation setting and experiences along a continuum from roaded and developed lands to unroaded areas. Wilderness is best described by the ROS "Primitive" class, large natural areas more than eight kilometres from a road on which a highway vehicle can be driven. Virtually all of the study area has a "Primitive" ROS class, with the exception of the Haines corridor and the lands around the Windy Craggy site.

Lands within the Haines Highway viewshed are classed "Roaded Resource" and "Semi-Primitive Motorized". "Semi-primitive" lands are less than eight kilometres from a road on which a highway vehicle can be driven, with some evidence of human use. "Roaded Resource" lands are accessible by highway vehicle, but with a natural environment and no more than moderate evidence of human use. The "Semi-Primitive Motorized" class accounts for lands adjacent to old mineral exploration roads that connect with the highway, for example at the headwaters of the Klehini River, at Dalton Post/Shaw'ashe, and northwest of Dalton Post.

The lands at the Windy Craggy site would also be classed "Roaded Resource", ringed by a zone of "Semi-Primitive Non-Motorized", then "Primitive" outside an eight kilometre radius from the development site. The Windy Craggy site is the only anomaly in the "Primitive" ROS class in the region, west of the Haines corridor.

In 1988, 24 million hectares or 25% of the province was classed "Primitive" (Vold, 1990). "Semi-primitive Non-motorized" classes account for a further 21% of the province. Within the Boundary Ranges ecoregion, 95% of all lands are unroaded, while 92% are unroaded in the Tatshenshini Basin ecoregion (Vold, 1990). In the province as a whole, the Tatshenshini-Alsek study area accounts for a substantial portion of the remaining "Primitive" ROS class. There are, however, no other areas in B.C. that could provide a substitute amount of "Primitive" lands in an area with the same ecological characteristics. This is because the ecological conditions found near the Tatshenshini-Alsek confluence are found nowhere else in the province.

5.3 RECREATION USE

5.3.1 Existing and Potential River Users

The first commercial raft trip on the Tatshenshini River was in 1976, while several private raft and canoe parties descended the river in the previous decade. The first recorded kayak descent of the Alsek River was in 1971, while commercial rafting activity did not commence on a regular basis until 1990. In 1979, about 30 parties descended the Tatshenshini, growing to 36 by 1984. In 1991, about 1,000 people descended the rivers, with departures on each of the available days. At least 80% of recreational use occurs on the Tatshenshini River, mainly because Turnback Canyon on the Alsek is unnavigable except by experts at certain water levels. The portage is difficult and the flight around the canyon is expensive.

If all commercial and private rafting departure capacity is used, including the shoulder seasons, the two rivers have a capacity of 1,960 users per year (U.S. Department of Interior, 1990).

Rafts are the craft of choice for both rivers, except for a few private kayak or canoe parties. Kluane National Park is encouraging more use of the upper Alsek River (actually called the

Dezadeash) down to the Lowell/*Naludi* Glacier. The park management plan allows for jet boat and hovercraft tours on the upper Alsek on a trial basis. Today, most river travellers on the Tatshenshini and Alsek are guided by commercial operators, but private use is increasing.

Private kayaking, canoeing, and rafting are popular on a weekend basis on the upper Tatshenshini and Blanchard Rivers, upstream of Dalton Post/Shaw'ashe. Commercial day and weekend raft trips are also provided to Yukon residents and tourists. Use of the upper Tatshenshini has increased dramatically in the last 5 years and is one of the premier whitewater destinations in the Yukon. Today, 12 commercial trips per year raft on the upper Tatshenshini, each with up to 20 or more clients. Each year an estimated 100-150 user-days are spent on the upper Blanchard and Tatshenshini River by kayakers and canoeists. Total day and weekend use of the upper river by all types of boaters is estimated at 350-450 user-days.

(See also Section 8.4 comparing the Tatshenshini-Alsek Rivers to three other north coast rivers.)

Dalton Post/Shaw'ashe

Dalton Post/Shaw'ashe in the Yukon is the starting point for all rafters or other boaters using the lower Tatshenshini River, and is the take-out and camping point for day and weekend users on the upper river. The site is fairly small, yet accommodates camping, rafting, kayaking, sport and subsistence fishing users. This has resulted in seasonally crowded conditions, conflicts with grizzly bears, conflicts real and perceived between user groups, garbage, potential human waste problems, deterioration of heritage resources, and a perennial management headache. Informal camping, parking and raft unloading areas have evolved, but a long term site and management plan for the area are not yet confirmed.

Permits

In, 1989 Glacier Bay National Park completed an Alsek River Management Plan allowing for an average of one river trip per day. A total of 72 parties are permitted to take-out at Dry Bay from July 1-September 10, although this high season was recently extended to June 19 through September 10. Forty-two (21 US and 21 Canadian) of these are reserved for commercial guides. More than 40 trips are scheduled by Canadian guides for 1992, in addition to the 18 permitted trips for U.S. guides (National Park Service, memo, 1992). Party size limitations have been discussed, with some of the commercial operators running trips with 20-25 people. Glacier Bay National Park staff have suggested party sizes of 15.

User Characteristics and Expectations

The Tatshenshini-Alsek Rivers provide one of the top 14 wilderness rafting trips in the world, in large part because they offer one of the longest trips in what is termed "true" wilderness (U.S. Department of Interior, 1990). The quality of the wilderness experience is dependent on the contiguous expanse of wilderness from Canada to the United States.

River users' perceptions about the region are an important part of the wilderness assessment. It is the natural environment of the region that motivates these river users to pay an average of $2,000 (exclusive of travel costs) for the privilege of experiencing the rivers. The number of river users is also critical because it is the wilderness experience that is one of the most outstanding attributes of the Tatshenshini-Alsek Corridor. Other rivers may offer superior whitewater challenges or better fishing, but may not be as sensitive to numbers of users.

Carrol and Johnson, (1985) completed the most recent study of Tatshenshini-Alsek River user characteristics. The study found the average river user on an extended river trip was a "middle-aged, upper middle class, well-educated professional with moderate amount of river experience":

Age: Mean age of 41.5
Education: Very high levels, with 93% having attended college
Occupation: 64% were managerial or professional
Outdoor Experience: 75% had previous backcountry river experience
Motivation: Backcountry experience

In 1985, encounters with other parties were quite low. But 83% did see four or fewer parties, with the average number of encounters at 2 over a trip duration of 10.5 days.

Most people expected to encounter fewer than one party per day. Nearly half of the respondents hoped to see no other parties, while 75% preferred to see one or fewer parties on a daily basis. Only 25% expressed a tolerance for seeing more than two parties per day. In 1984, the number of encounters was within expected limits for most river users (Carrol and Johnson, 1985).

As with many wilderness travellers, 85% felt that being camped within sight of others would detract from the trip enjoyment. Most users did not feel that the rivers were crowded in the summer of 1984.

Poor weather and insects were thought to be moderate or serious problems by 25% and 14% respectively. Lack of wildlife to photograph was considered a problem by 63% of users, but as a serious problem by only 12%. About a third of the respondents felt that recreational use was having adverse environmental problems on the rivers, but that the impacts were slight. River users preferred wilderness management strategies that would limit use to avoid overcrowding, and minimize visible human impact (Carrol and Johnson, 1985). The great majority of users did not perceive problems with the commercial fishing operation at Dry Bay.

Other Navigable Rivers

The Chilkat, Klehini and Tsirku Rivers near the Haines Highway provide shorter duration rafting, air-boating, canoeing or kayaking opportunities. The rivers are swift, but have no whitewater (Alaska Wilderness Milepost, 1990). The Klehini-Chilkat trip takes 4-6 hours, while the Tsirku-Chilkat float takes 1-2 days. Access is by highway and road for these rivers, except for the Tsirku, which requires a floatplane to reach the headwaters. Commercial and private use of these rivers is by residents of Haines as well as tourists.

5.3.2 Guide-Outfitting and Hunting

One guide-outfitter from Atlin, B.C., operates in the study area guiding mainly non-residents. The region is open to resident hunting. The Yukon side of the Tatshenshini is in the Kluane Game Sanctuary and is closed to sport hunting.

Most of the hunting in the heart of the Tatshenshini-Alsek region is by non-residents using guide services. About 25 hunters annually are taken into the region. Hunting is done for grizzly bear in the spring and sheep, goats and other species in the fall. Horses and tent camps are used to take guided hunting parties from the Stanley Creek base camp to the Parton River, Scottie pass, O'Connor River, and Tatshenshini River (Geddes Resource, 1990).

Abandoned airstrips, gravel bars, and lakes may also be used for air access into the region, while road access is limited to the Haines Highway and mining exploration roads.

The Haines Highway area is a prime resident hunting area, for moose and other big game species. Moose are hunted from camps near the Haines Highway. Residents also hunt ptarmigan along the highway. Some non-resident small game hunting licences are bought by Alaskans, also to shoot ptarmigans. Haines summit is provincially known as a falcon collecting area.

5.3.3 Native Food Fisheries and Sport Fishing

Sport fishing has been popular for 30 years at or near Dalton Post/Shaw'ashe where the clear waters of the Klukshu River join the main stem of the Tatshenshini River. Dalton Post/Shaw'ashe provides the only Yukon access to a Pacific drainage where salmon may be caught (The Taku River provides similar opportunities south of Atlin for northwestern B.C. residents). It is one of the most popular sport fishing sites in the Yukon, with 20-50 anglers per day during the season. In 1991, 388 chinook salmon, 303 sockeye salmon and 260 coho salmon were caught by sport fisherman. 509 chinook salmon, 2,011 sockeye, and 217 coho were caught for the native food fishery (Egli, Jackson and Smarch, 1992). These numbers are considered to be conservative estimates due to the counting techniques used. The ten year (1981-1990) average catch for sport fishing at Dalton Post is 318 chinook salmon, 441 sockeye salmon and 91 coho salmon. The ten year native food fishery (1981-90) was 174 chinook, 2,163 sockeye, and 5 coho.

Salmon are also caught for subsistence use in the Alaskan portion of the Alsek drainage. Additional, though unquantified numbers of salmon originating from the Canadian portion of the Alsek drainage are taken in Alaska sport and troll fisheries.

Kelsall Lake, east of the Haines Highway provides the only large lake fishing opportunity in the study region, with Dolly Varden reported. Access is difficult along a rough four-wheel drive road. Other smaller lakes, such as those near Scottie Mountain are accessible by horse or foot and may be fished by hunting parties.

5.3.4 Wildlife Viewing

While the wildlife viewing in the Tatshenshini-Alsek River was only rated as average by a survey conducted in 1984 (Carrol and Johnson, 1985), this perception may be specific to the rafting clientele group. Also, this client group may well have visited or be aware of other locations such as National Parks in Africa, where wildlife viewing is the main natural attraction. There are no obvious or dramatic wildlife spectacles during the summer season, such as grizzly bears at the McNeill River in Alaska, or easily seen Dall's Sheep at Sheep Mountain in Kluane National Park. Wildlife are present but some effort is often required to observe many of the species.

The Draft Alsek River Management Plan 1988 also suggested wildlife viewing on the Tatshenshini-Alsek Rivers is average in comparison to other rivers in Alaska and Western Canada. In contrast to this sentiment, one rafting party saw 12 bald eagles per day and in a two day float from Sediments Creek a party saw 20 bald eagles, 10 mountain goats, 3 swans and several American Kestrels (Geddes Resources, 1990). Other parties have reported seeing several grizzly bear, black bear, mountain goat, Dall's sheep, fox, and numerous bird species (Peepre, pers. experience). Spring and fall migratory bird staging in the lower Alsek region, would provide good viewing, but few if any visitors are in the area that time of year.

The chance to see wildlife frequently while floating in rafts may only be average in terms of quantity, but the quality of opportunities on and off the river are superb by all anecdotal accounts. Short hikes to alpine and sub-alpine areas consistently reveal sheep, goats, black bears, grizzly bears, fox, and avifauna. Moose may be seen along the rivers edge and in side channels on the lower river.

The rare experience of seeing grizzly bears, or grizzly bear signs on the Tatshenshini-Alsek Rivers is very rewarding to most people. Other unusual animals such as blue glacier bears or collared pika may be seen by only a few travellers, but the chance to view them will be highly valued. Along the Haines road, willow ptarmigan, falcons, Dall's sheep and mountain goats are often seen.

The importance of viewing birdlife is sometimes underestimated in assessing wildlife viewing potential. The Chilkat Eagle Preserve draws more than 30,000 people per year, while the Haines corridor is also known as a popular destination for bird-watching. The Shakwak Valley is an important flyway, drawing birders in spring and fall. As more information on the birds species of the Tatshenshini-Alsek areas becomes known, bird watching will increase in importance.

The Klukshu and Takhanne rivers, and Goat Creek provide excellent opportunities to view spawning salmon and traditional capture methods. The salmon trap at Klukshu village provides one of the only places to witness this capture method in Canada. The Department of Fisheries and Oceans operates a small demonstration box for chinook and sockeye salmon on the Klukshu system adjacent to the Haines Road.

5.3.5 Mountaineering and Hiking

Hiking and mountaineering in the region is mainly in the Haines Highway area or as side trips on rafting or kayaking trips down the Tatshenshini-Alsek Rivers. Most rafting parties spend 1-2 days hiking to ridgetops or on glaciers in the river valleys. Alpine meadows are easily accessible at several locations along the rivers. Large creeks and glacial outwash sites also provide attractive hiking opportunities. The best known hiking locations on the Tatshenshini include Detour Creek, Sediments Creek, O'Connor confluence on west side, Melbern Glacier area, and "Walker" Glacier in the U.S. On the Alsek River, hikers use the many mountain ridges descending to the river, as well as the Tweedsmuir and Lowell/*Naludi* Glacier area.

The Haines Highway area and points west and east are important for local use in both winter and summer, although summer use is more popular. The Three Guardsmen, Boundary and Datlasaka Ranges are mountaineering and hiking destinations. Yukon residents make ski mountaineering and ski touring trips from the White Pass area to Kelsall Lake, through rugged and very scenic country. Haines residents climb the mountains west of the Klehini River and the mountains near the headwaters of the Tsirku River. Chilkat Guides out of Haines use areas in B.C. for commercial trips, typically flying into a site for hiking and mountaineering, then rafting out to Dry Bay on the Alsek River. This company has explored the Tkope, Klehini, Chilkat, and O'Connor River areas, as well as the Tsirku Glacier (MacKenzie, pers. comm.).

The climbing and ski mountaineering potential of the Alsek and Fairweather Ranges is largely untapped due to the region's remoteness and difficulty of access. These characteristics in themselves, however, are an attractive feature that draws those seeking a remote wilderness climbing experience. Mt. Fairweather, at 4,663m (15,300 ft). is an internationally known climbing destination, providing 5 moderate to difficult routes from various approaches.

Alan Carpe first climbed the mountain in 1931, but the peak was not attempted again until 1958. Several climbs were made in the 1970s and in 1991, 4 expeditions visited the mountain. Most of the climbing routes are approached from the American side, although climbs from B.C., at Tarr Inlet, have also been done.

5.3.6 Cross-Country Skiing and Snowmobiling

These two winter activities are limited to the Haines Highway corridor. Each winter, local groups make the Haines summit, Kelsall Lake, Samuel Glacier area and points in between a weekend destination. The corridor is popular for skiing and snowmobiling, attracting perhaps 20-25 ski parties and dozens of snowmobile parties per year. The prime skiing and snowmobiling season is March through April. The shorter driving time from Whitehorse to the White Pass area on the south Klondike Highway has meant less use of the Haines Summit area by Whitehorse residents. Alaska residents may use the lower Haines Highway corridor more than Yukon residents. Snow quality is not always as reliable as the White Pass area, with depth hoar frost sometimes creating bottomless conditions popularly referred to as "wallowing".

5.3.7 Vehicle Touring/Scenic Viewing

The Haines Highway is a major route to the Yukon and Alaska. Each year, about 45,000 tourists travel north and south on the highway to and from Alaska (Yukon Visitor Exit Survey, 1987). The Haines highway is also part of a popular weekend or three day circle tour from Whitehorse to Kluane National Park and Haines, then by ferry to Skagway and on to Carcross and Whitehorse. Side trips to Atlin, B.C., are sometimes taken on this circle tour. The trip has a reputation as the best short scenic trip in the southern Yukon.

5.3.8 Other Uses

Picnicing/Camping

Picnicing and camping are popular along the Haines Highway in territorial and National Park campgrounds and day use areas. Dalton Post/Shaw'ashe is also used for unorganized camping, usually in association with fishing, rafting or kayaking. B.C. does not have any organized campsites or day use areas on its portion of highway. A territorial campground, picnic shelter, and trails are located at Million Dollar Falls in the Yukon. The next nearest campground is north at Dezadeash Lake, and further north still the Kluane National Park campground at Kathleen Lake.

Gathering and Collecting

Gathering and collecting activities, for example berry-picking, occur in accessible areas near the Haines Highway and off the short spur roads leading from the highway. People from the village of Klukshu use the region for their harvesting activities.

Four-wheeling/ATV use

Mechanized off-road travel occurs along the Haines Highway, but the extent of the activity is unknown.

Horseback Riding

Recreational horseback riding in the study area is served by at least one operator, a member of the Champagne-Aishihik First Nation, offering day or overnight trips in the Blanchard River area. The guide-outfitter in the region uses horses for hunting near the Haines corridor, and for access into the O'Connor and other drainages. Private horse use of the region is probably limited to hunting parties, although longer guided horse riding trips have been proposed for the Dalton Trail, from Dalton Post/Shaw'ashe north.

Bike Touring

Bike touring has increased on northern highways, and the Haines Highway is used by tourists biking to Alaska or the Yukon. Regional residents also complete the circle tour through Haines and Skagway. Mountain bikes are used on old roads off the Haines Highway to reach destinations such as Kelsall Lake, or Mineral Mountain.

5.4 RECREATION USE AND LIMITS OF ACCEPTABLE CHANGE

One departure per day has been used as the benchmark for maximum allowable use on the Tatshenshini, while still providing a wilderness experience and minimal encounters with other groups. The wilderness recreation carrying capacity for commercial parties on the Tatshenshini River has therefore already been reached, if the benchmark is maintained. Use of the upper Alsek River has not reached this same rate of departures, but is limited by the total numbers allowed in Glacier Bay National Park, and by the allocation of commercial permits. More use of either river would reduce the quality of the wilderness experience.

The "one departure per day" benchmark, however, does not address the limits of acceptable environmental change. All anecdotal accounts suggest that minimum impact camping methods are practised rigorously, particularly by commercial parties. Yet fragile dryas meadows, shrub vegetation, bear and other wildlife habitat on the floodplain are almost certainly affected by recreational use. It is not known if recreational use has changed wildlife use patterns. The existing conditions are not documented, nor has there been any scientific measurement of change. Anecdotal evidence from Glacier Bay National Park and Preserve, suggest that vegetation has been affected at high use campsites, such as at "Walker" Glacier (Alsek River Management Plan).

Dalton Post/Shaw'ashe in the Yukon has been the most affected by recreational and other use, and is now a "disturbed site". Conflicts between recreational users and grizzly bears are common, and several bears have been disposed over the years. Deterioration of heritage resources and human waste are long term management issues not yet resolved.

In the Haines Highway area the effects of mechanized backcountry travel on sheep or goat populations are not known. Summer recreational use is relatively light, but the effects of mechanized or non-mechanized travel in the backcountry are unknown.

Existing information on biophysical resources and recreation use in the region does not provide sufficient data to determine baseline environmental conditions, resilience to human impacts, or limits of acceptable change. These are topics for further research.

5.5 TOURISM CAPABILITY AND ATTRACTIVENESS

5.5.1 Tourism Resource Description

The tourism resource in northwestern British Columbia is highlighted by superb scenery, wilderness, wild rivers and wildlife resources (Ethos, 1991). The North by Northwest Tourism Region sustains a growing tourism industry with such well known destinations as the Queen Charlotte Islands, parts of the Inside Passage, Spatsizi Plateau, Stikine River, and the Tatshenshini-Alsek Rivers.

The B.C. Parks tourism travel routes goal is to provide park attractions and services which enhance the province's major tourism travel routes. The Haines Highway tourism travel route, Haines to Haines Junction is described as "an outstanding northern wilderness highway route, with exceptional alpine scenery", considered to have inadequate land base in parks (Ministry of Parks, 1990). Attractiveness in the B.C. Parks plan is linked to alpine scenery viewing, sea to sky landscape appreciation, vegetation zonation and wildlife viewing.

The tourism resource in the Tatshenshini-Alsek portion of northwestern B.C. is defined by landforms, biophysical and human resources outlined in this report. In the tourism context, the wilderness, rugged topography, scenery, and rivers shape the tourism product. The rivers and mountains create the environment for the backcountry adventure travel in the Tatshenshini-Alsek and Mt. Fairweather areas. The topography and alpine vegetation of the Haines corridor defines its attractiveness as a frontcountry automobile touring route, as well as an access point to the backcountry. (Backcountry and frontcountry tourism zones are defined by Ethos, 1991). The region's natural resource attributes are described elsewhere in this report. A summary of those key attributes contributing to the tourism attractiveness of the region are shown in Table 2.

Most people overlook the cultural heritage of the study region as a tourism resource, particularly people perceiving the area as a remote northern wilderness "untouched by man". The cultural dimension provides another attractive reason for tourists to visit the region. Evidence of the cultural heritage is visible at old village and archaeological sites, but also in present day villages, fishing or harvesting sites. The invisible heritage is revealed in the native place names (eg. Lowell Glacier in Southern Tutchone is *Naludi* meaning "fish-stop" and Gateway Knob in Tlingit is Yadagwat or "stones that continually roll down from it".), old trail routes (eg. Dalton or Chilkat Trail, as well as many unnamed routes), and stories about the Tatshenshini or Alsek Rivers, for example the great floods.

The cultural dimension is very much a part of the wilderness character of the region as it can broaden the tourist understanding from "untouched by man" to one of "homeland and larder" in a magnificent natural setting.

Table 2: Summary of Wilderness Related Tourism Resources

Tatshenshini-Alsek		
Wilderness:	-	region largely intact, little evidence of human activity,
	-	wild rivers,
Viewscape:	-	diverse, spectacular viewscape,
	-	accessible, unusual visual features,
	-	view of Mt. Fairweather,
	-	no alteration in most of region,
	-	high elevation differences, steep slopes,
Landforms:	-	rugged, scenic, glaciated mountains,
	-	huge valley glaciers, glacial features,
	-	transition from coastal to interior, mountain forms,
	-	diversity of landforms,
Wildlife and Fish:	-	wilderness-associated wildlife,
	-	grizzly bears, Dall's sheep,
	-	blue glacier bear,
	-	variety of salmon species,
	-	rare or unusual birds,
	-	migratory bird staging areas,
Vegetation	-	transition from interior to coastal,
	-	accessible alpine tundra,
	-	huge dryas meadows,
	-	rare plants,
	-	contrasting vegetation zones,
Cultural Heritage	-	native heritage, river use,
	-	oral history,
	-	village, camp, or spiritual sites,
	-	historic trails, buildings,
Haines Highway Area		
Viewscape:	-	diverse, mountainous viewscape,
	-	road accessible alpine tundra,
	-	moderate alterations, not dominant,
	-	high relief, steep slopes,
Landforms:	-	scenic mountains, glacial features,
Wildlife and Fish:	-	Dall's sheep, mountain goats,
	-	salmon at Dalton Post/Shaw'ashe,
	-	ptarmigan, falcons, eagles,
	-	other rare or unusual birds,

Table 2: Haines Highway cont'd

Vegetation	-	transition from coast to alpine,
	-	accessible alpine tundra,
Cultural Heritage	-	native heritage, trading, oral history,
	-	village sites, historic buildings,
	-	historic trails and personalities,
	-	modern lifestyles, subsistence harvest.

5.5.2 Climate

The climate of the region limits its mass tourism appeal, but does not reduce its potential for backcountry adventure travel and touring. The frequently cool and wet coastal weather experienced by people on the lower Tatshenshini has not, by most accounts, dampened enthusiasm for the experience. Even those touring on the Haines Highway during the short summer season may view the frequent inclement weather as part of the "northern experience". Snow in summer on the Haines Highway is a favourite conversation topic.

5.5.3 Location

The remoteness of the region relative to the rest of the province also defines the tourism product. There are no B.C. communities or tourism facilities in the study area, with the closest village of Atlin about 5 hours away by ferry and highway. The cost of reaching the region is high, and fewer tourists make the journey in comparison to more accessible regions. The Haines Triangle draws all of its visitors from outside the region, whether they are from the Yukon, B.C., Alaska, or the rest of North America. The fact that the Tatshenshini-Alsek region is an international destination for tourists seeking a premier wilderness adventure, in spite of these access limitations, speaks for the quality of the natural environment.

5.5.4 Access

Access to the Tatshenshini-Alsek region is costly for residents of southern British Columbia, but the area is "next door" to residents of the southern Yukon and Alaska. The nearest regional airports are Whitehorse, Yukon (4 hours away by road), and Juneau, Alaska (6 hours away by ferry and road). The airport at Yakutat does not normally service most visitors to the region, since the river rafters fly out from an airstrip at Dry Bay. From a tourism industry perspective the access to this part of B.C. is an anomaly, since half or more of the river rafters fly into and out of Juneau, Alaska, without ever using any Canadian services. Canadian rafting companies fly their clients into Whitehorse, benefiting Yukon tourist services.

Tourist access to the backcountry in the region is by boat, bush plane or helicopter, on foot or skis, by horseback or snow machine. Airstrips are located at Haines Junction, in the Yukon, Haines, Dry Bay and Yakutat in Alaska, and Windy Craggy in B.C. A rough airstrip, condition unknown, is also located at O'Connor Creek. Float planes may also land at various points along the rivers.

The Alaska Highway provides the only road link from southern British Columbia, once in the Yukon, but the Haines Highway is used by Alaska Marine Highway travellers. Many

travellers are bound for Alaska, passing quickly through the B.C. part of the highway. There are no highway services in the study region.

The Haines Highway is an important link in a circle tour from Whitehorse to Haines and Skagway, drawing hundreds of local residents annually on repeat trips, and thousands of tourists. A visit to the region would be a fairly long side trip for Alaska Highway travellers passing through Whitehorse.

Developed trails in the region are limited, since many of the historic routes are overgrown. The Yukon portion of the Dalton Trail has been partially cleared in the last five years. Along the Haines Highway, the Dalton Trail, Chilkat Trail and other routes are still sometimes followed by adventurers. Guided hunting trails are located in the O'Connor River area as well as several other drainages. Most trails are more accurately described as routes.

5.5.5 Land Status

Land status affects tourism by placing constraints on access and development. The entire B.C. study region is provincial crown land now, although the Champagne-Aishihik First Nation have filed a land claim for much of the area. The Yukon part of the study region is federal crown land, with portions also within a land claim area of the Champagne-Aishihik First Nation. The Yukon portion of the Tatshenshini River is under review for a potential Canadian Heritage River designation. Land use and status do not, at present, limit tourism potential. Tourism potential could increase with protected area designations such as National Park, Provincial Park, Recreation Area, Wilderness Area or Heritage River. Protected area designations have marketing value, as well as protecting the tourism resource.

5.5.6 Tourist Profile

River travellers are described above as well educated professionals with above average incomes, the majority of whom are middle-aged males. Tourists using the Haines Highway are typically retired American couples travelling in private recreational vehicles. Younger families with children also travel the route, often equipped with camping gear. Very few stop in the study area, mainly due to a lack of facilities. The territorial campground at Million Dollar Falls is used, and some tourists camp at Dalton Post/Shaw'ashe. Many visitors stop in the Haines area or at Haines Junction near Kluane National Park.

Most tourists are on holidays, en route to Alaska. Up to 80% are from the United States, with most of the remainder from Canada, and a small percentage from overseas. The Yukon Visitor Exit Survey (1987) found that travellers on the Haines Highway were on one of several routes including: north-bound one-way, south-bound one-way, or on a northern circle trip. About 45,000 tourists use the highway each year, 10,000-15,000 travelling northbound, and 15,000-20,000 southbound. Average vehicle occupancy is 2.6 persons.

5.5.7 Tourism Products

The tourism products in the study region are entirely resource dependent. The service sector is nonexistent inside the study region, while adjacent services lie in the Yukon and Alaska. A change in the natural resource attributes will change the viability of wilderness-dependent tourism products.

The adventure tourism product in this remote location compares favourably with similar products around the world. The marketing image of the region's tourism products play an important role in attracting visitors to the northwestern part of B.C. and to the province in general.

Since the Haines Highway serves as a route to Alaska, people travelling the highway are motivated by a variety of tourism products not necessarily available on this part of the route. For example, some tourists may use the highway to visit friends or relatives. The tourism product analysis in this report is limited to the resource based tourism products in the study area. These product sectors, according to methods now used by Tourism B.C., are "Outdoors/Adventure" and "Touring", with limited potential for a "Resort" as defined by Visitors '89.

Some existing methodologies for assessing *natural resource based* tourism tend to overlook cultural heritage resources, in particular native heritage. Native heritage is strongly linked to natural resources, and there is a proven desire by tourists to interpret these links and understand past and present native ways. The "Cultural Heritage" tourism product is flourishing in the north and includes activities such as accompanying native guides on trapping or fishing trips, trail riding trips, or living with families on the land. The "Cultural Heritage" product has not yet been developed in the study region, but it has strong potential. The native village of Klukshu, the historic villages of Neskatahin, native fishing methods at Klukshu River, the Dalton Trail, Chilkat Trail, archaeological and petroglyph sites on the Tatshenshini, historic river route trading and travel, could all add a dimension to the wilderness related tourism product in the region.

Tatshenshini-Alsek Backcountry

The Tatshenshini-Alsek area including Mt. Fairweather provides an internationally known "Outdoor/Adventure" tourism product. The region offers land and river adventure activities of international importance, and fish and wildlife related products of provincial and regional significance. The river adventure tourism product draws the most visitors, mainly for rafting. The rafting product is supplemented by hiking, wildlife viewing, and cultural heritage interpretation. The potential for guided canoeing or kayaking trips on the Tatshenshini and Alsek Rivers is limited by river characteristics such as wind and very difficult rapids or portages (eg. Turnback Canyon on the Alsek River).

Guided hunting has been a tourism product in the region for many years. Since the operation is based in Atlin, B.C., there is a direct economic benefit to the province. The operation may offer non-consumptive wildlife viewing and nature appreciation activities in the off-season. In the northwest part of the province, the U.S. market for hunting is the most important providing 81% of clients, followed by overseas markets at 15% (Ethos, 1991).

Fishing is at best a limited destination tourism product in the study area, with few accessible productive lakes and streams. Clear streams in the Tatshenshini drainage provide good salmon fishing and viewing on a local and regional basis, but the main stems of both the Tatshenshini and Alsek Rivers provide poor sport fishing opportunities. The fishing product is best described as providing secondary activities for tourists on other types of adventure trips or while touring. There is limited potential for fishing lodges or resorts in the study region due to the lack of sizeable fish-bearing lakes.

Mt. Fairweather is a provincial landmark, and adds appeal to the land adventure tourism product in the area. As a tourism resource, however, its importance is limited due to its remote location. Compare Mt. Fairweather to Denali in Alaska, for example. Mountaineering on other peaks in the region is a viable adventure tourism product, now served by guides out

of Haines, Alaska. Canadian guides serve the upper Alsek River drainage (eg. Lowell/*Naludi* Glacier), with few mountaineering trips are offered in the Alsek Ranges or southern parts of the St. Elias ranges. Wilderness mountaineering and ski mountaineering in the study area have high growth potential due to the attractive glaciated setting, parts of which compare favourably with Kluane National Park.

The cultural heritage product in the Tatshenshini-Alsek corridor relates to historic native trading and travel routes, flood events, archaeological sites, village sites, native place names, European exploration, and the more recent early and mid-twentieth century mining history in the Squaw Range (including mining by native people).

Haines Highway Frontcountry

The Haines Highway corridor provides an important regional "Touring" product, serving the so-called rubber tire market. Most travellers on the highway merely pass through the study area, but those on a circle tour generate greater regional tourism revenues. The corridor serves both Alaska-bound tourists and those who are visiting the region as a destination, and are travelling the circle tour as a side trip.

A secondary potential product, relative to "Touring" in the Haines corridor is "Outdoor/ Adventure Tourism". This sector is usually categorized into hunting, fishing and adventure (Ethos, 1991). All three are popular in the corridor now, although there is limited potential for further commercial growth. One guide-outfitter with an international clientele already serves the entire region. Guided horse riding is also offered in the Haines Highway area. Sport fishing is notable only in the Dalton Post-Blanchard River area, and there is little potential for growth on a commercially guided basis in the study area.

The potential for adventure tourism in the corridor has not been tested, but commercial skiing and mountaineering trips are sometimes offered in the area. Guides from Haines, Haines Junction and Whitehorse would offer these services. The Haines corridor is also known as a bird-watching and sheep viewing area, and draws many visitors to the region. No known local commercial operations offer wildlife viewing in the Haines corridor, but the potential for an "ecotourism" focus is apparent. Swiftsure Tours includes the Haines Highway as part of longer nature appreciation trips. Other adventure tourism products that may be viable in the Haines corridor include bike touring, snowmobiling, trail riding, dog-sledding, and backpacking. Most of these latter activities, however, would draw regional residents from the Yukon and Alaska, not points south.

Potential for resort development in the southern part of the corridor is limited by frequent poor weather, short season, and distance from airports. New resorts are planned just north of the study region, near Kathleen Lake in Kluane National Park Reserve, while Haines has a number of resorts in operation now. Clients of these resorts may well tour through the Haines Highway corridor.

Huts providing rustic overnight accommodation as part of multi-day trail riding, skiing, hiking, or native cultural experience packages would be feasible in the region. Studies for the Dalton Trail have concluded that a market exists for this type of product (Ferrence and Peepre, 1987). Backcountry routes west of the Haines corridor or east towards the White Pass or Kusawa Lake area are attractive and could be developed.

Heli-skiing and cat-skiing adventure tourism products are limited by frequent poor weather and visibility, frequent poor snow conditions for snowcat access and skiing, long flying time from the nearest helicopter base, and limited regional markets. Somewhat better conditions for these activities are located in the White Pass area, adjacent to the south Klondike

Highway. Snowmobiling as a tourism product is viable in the corridor, but travel time from local markets and regional airports may limit opportunities, unless lodges or other services are developed.

The cultural heritage product in the corridor focuses on the native villages, Dalton Post/Shaw'ashe, Chilkat Trail, Dalton Trail, native fishing methods, trading patterns and modern lifestyles.

Table 3: Tourism Product Capability*

Sector	Segment	Activity	Capability
Outdoor/Adventure	water	rafting	high
		canoeing/kayaking	mod/high
	land	backpacking	mod/high
		mountaineering	high
		horse riding	high
	fish/wildlife	guided hunting	high
		wildlife viewing	mod/high
		guided fishing	low
	winter	heli-skiing	low
		snow-cat skiing	low
		snowmobiling	high
		ski touring	high
Touring		automobile touring	mod/high
Cultural Tourism			mod/high
Ecotourism		guided backcountry	high
		guided frontcountry	mod/high

* Cultural tourism and ecotourism categories were added to this list as part of natural resource-based tourism. Ecotourism can be considered part of the "Outdoor/Adventure" product, but with a focus on nature appreciation.

5.5.8 Tourism Resource Capability Summary

The tourism resource and product evaluation indicate that both the Tatshenshini-Alsek and Haines highway corridor should be regarded as "high tourism potential areas" in an international, national and provincial context, for the specific adventure tourism and touring products outlined in this report. This ranking is based on the region meeting all of the essential conditions for the tourism products described. It also has a high concentration of other attributes which serve to enrich the tourism experience (criteria defined by Ara Consulting et al, 1991).

The overall tourism capability class for the Tatshenshini and Alsek River valleys would be "very high" according to the rating methodology used for the Northwestern British Columbia Natural Resource Based Tourism Study (Ethos, 1991). "High" capability is indicated for the Haines Highway, with a "moderate" rating for the interior mountain ranges of the study area.

The rating system is designed to identify sites or areas with a composite of several "high" product ratings. For example, the Tatshenshini River area provides a product with high ratings for rafting, hunting and wildlife viewing. Few constraints limit these activities in the Tatshenshini corridor, and they attract an international clientele.

According to methodology developed for mapping heritage tourism potential (Aras et al, 1991), the region would be classed as having "good" potential, for both native heritage and Euro-Canadian heritage interpretation. In the study area it may be difficult to separate all native heritage and Euro-Canadian heritage resources, and attempts to classify them as separate entities can distort the historical picture.

The "good potential" ranking is based on the heritage significance, integrity, access and capability for development. In summary, the cultural heritage resources in the study area are of territorial and provincial significance, although visible resources have been altered to some extent (eg. destruction of historic buildings at Dalton Post/Shaw'ashe). Access to many visible heritage sites is good, while the capability for development is rated as moderate to good. The potential for interpreting historic trade, linguistic patterns, and native oral history through storytelling is high.

These tourism resource and product ratings do not take into account the intrinsic value of these areas for wilderness or for protecting biodiversity. Nor do they reflect their importance for local and regional recreation use or subsistence harvesting. The ratings do, however, show that the highly rated tourism products for the region are wilderness-dependent or wilderness-associated.

5.6 RESEARCH NEEDS

Recreation and visual features inventories have been completed for the Tatshenshini and Alsek River viewsheds, and recreation features mapping is complete for the Haines Highway area. Biological and geological research recommended in this report will help define recreation values and management issues. For example, little information is available on the ability of popular campsites on the two rivers to withstand recreational use. Baseline biological data will help correct this deficiency.

No further features inventory work is required to define recreation resources, except where roads or other developments are proposed or approved. Detailed recreation features mapping has not been completed along the O'Connor River, for example.

Good information exists for commercial rafting, guide-outfitting, and to some extent on the demographic profile of Haines Highway users. A user survey was completed on the Alsek River in 1985. Further recreation use research is not a priority at this time, although a follow-up user survey of both Haines Highway and Tatshenshini-Alsek River users would be worthwhile in two to three years. Such a study could help define user expectations, satisfaction, and patterns of use, all to help with any future management planning.

Tourism resource capability has not been mapped. Such mapping may be useful in the regional context, but is not recommended as a priority in this study. Of greater importance is a better understanding of the economic benefits of wilderness-dependent tourism in the region. This need is described in the next section of the report.

Recommended future recreation and tourism research tasks are:

- determine baseline environmental information at recreation use sites to allow monitoring of recreation impacts;
- determine limits of acceptable change for wilderness recreation and visual resources in the study area;
- conduct a recreation user survey on the Haines Highway and Tatshenshini-Alsek Rivers;
- complete tourism capability mapping;
- conduct recreation features mapping in vicinity of proposed roads.

6.0 WILDERNESS RESOURCE ECONOMIC VALUES

Wilderness resources have economic value, yet measurement of these values remains controversial. Some people believe that the true value of wilderness can not be appraised using economic assessment criteria, while others have devised methods to determine wilderness use or preservation values. Economic assessment of wilderness resources is only one aspect of evaluating land use options. Natural resources and cultural features related to wilderness, such as biodiversity, rare species, legend sites and subsistence harvesting may have economic value, but also have intrinsic qualities outside the realm of economics.

This summary does not estimate the economic value of the Tatshenshini-Alsek region. It outlines the key economic assessment techniques as they may apply to the region, and describes the context of preliminary work done by others. The summary suggests a framework for further research to ensure that all aspects of wilderness use and preservation are included in future assessments.

Economic assessments include two basic types. "Economic valuation" is concerned with social well-being. For example, what is the net value to society of preserving wilderness? This includes an assessment of how much society feels it is better off with wilderness and is frequently judged by asking what people would be "willing to pay" to continue to use and to preserve wilderness.

"Economic impact" assessments are concerned with the distribution of money, employment, income, tax burden, and other factors in society. Economic impact assessments do not assess the value of the wilderness resources, but do provide information on the financial and distributional impacts of wilderness use. These two types of assessments are both described below, but their respective context should be made clear.

6.1 WILDERNESS USE VALUES

The economic values of wilderness have been assessed in a variety of ways. Gross wilderness recreation use (direct consumption) values include expenditures by recreationists and their consumer surplus ("willingness to pay") values. Because wilderness recreation is not a market place commodity, recreation users are frequently willing to pay more for wilderness use than the expenditures they incur. This "willingness to pay" value is known as consumer surplus. "Economics" is concerned about social well-being, and therefore the net value (or benefit) of wilderness recreation use is considered to be the consumer surplus (willingness to pay) value.

"Economic impact" assessments address the distribution of money as a result of a given activity such as wilderness use. Wilderness use expenditures and multipliers assist in determining regional economic impacts, but are not a measure of net economic value. For example, revenues from a guided recreation activity such as rafting benefit commercial guides, but also contribute towards the assessment of regional economic impacts through the purchase of transportation, accommodation or other tourist services.

The net value of wilderness use such as with respect to rivers, has often been assessed using the travel cost method, developed almost 30 years ago by Clawson (1959). The idea is that travel expenditures provide a "proxy" or indirect market valuation for access to the non-market commodities (Bergstrom, no date) The travel cost method uses the premise that the number of trips to a recreation resource will decrease as dollar and time costs of travel increase (Walsh, Sanders and Loomis, 1985). Use on destination rivers such as the Nahanni,

Firth and Coppermine show that as these northern rivers have become better known, use has increased dramatically.

As mentioned, consumer surplus is a widely used measure of the value of wilderness and river recreation use (Walsh and Loomis, 1985). Consumer surplus is defined as "the difference between the maximum amount an individual is willing to pay and the amount paid (Walsh and Loomis, 1985)". The net recreation use value of wilderness or a river is the sum of consumer surplus for all individuals using the area. Walsh and Loomis found in separate studies of rivers in Colorado, that direct recreation use expenditures were approximately 19% of the gross economic value to society of maintaining the rivers in wilderness. For most individuals, the net benefits ("willingness to pay") of using wilderness far exceed the costs associated with the activity (Power, 1991).

For economic impact assessment, the regional output multipliers for recreation in the United States range from 1.5-2.6, with an average of 2.0 (Walsh, 1986). Different types of multipliers are used for employment, GDP, and income which may account for some of these differences. In Alaska, the multiplier for the visitor industry has been estimated at 1.5 (McDowell Group, 1991). The Yukon economy is similar to Alaska, and a 1.5 multiplier would appear to be reasonable for the region (no figure has been established). Even though few B.C. residents live permanently in the study area, there are monetary benefits to B.C. when people travel to the region to visit wilderness, or purchase guide-outfitting or rafting services in B.C.

Other use values have been called the commercial production values of wilderness (Yorks, 1990). Gross commercial production values include commercial fishing or wildlife harvesting, which may occur outside the wilderness, but may benefit from it. For example, the commercial fishery at Dry Bay, Alaska, depends on the integrity of salmon spawning areas in the Tatshenshini drainage.

Subsistence hunting, fishing, and other types of non-recreational harvesting are other use values which may be dependent on wilderness. These values may be considerable on a local and regional scale, and should be part of any economic assessment of wilderness. O'Leary (1985) completed a dissertation on the subsistence use of salmon by the Southern Tutchone. Muth and Glass (1988), point to the difficulty in separating recreational, commercial and subsistence users of wilderness, but suggest that leaving out a valuation of subsistence use leads to serious under estimation of the full economic value of wilderness resources. The loss of subsistence harvesting opportunities by a failure to account for their economic importance, can also translate into a loss of cultural values.

In summary, a full assessment of economic values and impacts derived wholly from the wilderness or dependent on the integrity of wilderness ecosystems in the region must include the factors listed below in Table 4. Multiplier effects should be incorporated into all economic impact assessments. Transboundary economic benefits are important to residents of the Yukon and Alaska and should be determined in addition to the benefits to British Columbia. No attempt was made in this study to assess the net economic value or economic impact of wilderness resources in the study area (See 6.5, Research Needs).

Table 4:

Factors to Consider in Assessing Economic Values and Economic Impacts Related to Wilderness in the Study Area

Recreation use values:

-guided river trips.
-private unguided river trips.
-sport fishing in Canada.

-private unguided land adventure trips
-guided hiking and mountaineering.
-guided and unguided hunting.

-vehicle touring along the Haines Highway.
-wildlife viewing values in Canada and adjacent lands
-wilderness-dependent use values in adjacent National Parks

Subsistence use values:

-all forms of harvesting.

Commercial and sport fishing values in Alaska.

Non-Use Preservation Values

6.2 NON-USE PRESERVATION VALUES

Preservation values of wilderness are sometimes called non-use preservation values. They are a measure of how much society values the preservation of wilderness. Walsh and Loomis (1985) used the contingent valuation method of assessing non-use preservation values. The method uses survey techniques to assess the value of preserving wilderness, in effect by creating an experimental market (Bergstrom, no date). In addition to non-use preservation values, some economists note economic benefits derived from the production and sale of wilderness information such as, books, film, periodicals and posters.

Non-use preservation values include (Walsh and Loomis,1985):

Option Value

A willingness to pay a premium over and above the expected recreation benefits of using a wilderness, in order to guarantee the opportunity to visit the wilderness in the future. Simply put, its an insurance premium to assure future use.

Existence Value

The satisfaction from knowing that wilderness exists as natural habitat for fish, plants and wildlife, even though you may not ever visit.

Bequest Value

The willingness to pay something now to bequest a natural area to future generations: the satisfaction from endowing future generations with wilderness.

Studies throughout the United States and in British Columbia have demonstrated that a large majority of society is willing to pay to preserve wilderness and recreation resources (Walsh and Loomis, 1988, Ministry of Forests, 1991). As wilderness resources diminish, the marginal benefits of preservation will likely increase in future.

Walsh and Loomis (1988), found that non-use preservation values increase with the scarcity of wilderness, and that as the number of protected rivers increases, the willingness to pay decreases. They found that preservation values declined with distance from the wilderness, although this observation may not be relevant to the Tatshenshini River area, since it is a nationally and internationally known destination.

Most studies of non-use preservation values of wilderness have concluded that these net values to society are either similar to, or greatly exceed, the net values associated with wilderness use. Therefore economic valuation techniques that do not account for non-use values will greatly underestimate the value of the wilderness resource.

6.3 FUTURE WILDERNESS VALUES

In order to determine present net values (PNV) in benefit/cost analysis (BCA), all the costs and benefits are discounted to a common time period using the "social discount rate". The practice of discounting is based on the concept of the time value of money, or that a dollar in the present is worth more than a dollar in the future. The choice of social discount rate is one of the most controversial aspects of BCA. Discount rates ranging from 3% to 10% are often used to discount future values, and sensitivity analysis is frequently conducted using alternative discount rates.

If the use and non-use wilderness values in the study area were $13.4 million per year as suggested by Tatshenshini Wild (1989), and these values continued in the future, then the present net value would be $241 million using a 4% discount rate, and $155 million using an 8% rate.

The use and non-use wilderness values held today will likely continue or even increase in the future. The "sustained flow of values needs to be taken into account in economic analysis by looking to the future and accounting for the benefits ... preservation efforts will have for future generations (Power, 1991)."

6.4 METHODOLOGY LIMITATIONS

The contingent valuation method to assess non-use preservation values of wilderness and wild rivers has been replicated and validated in many parts of the United States. The methodology does, however, have several limitations. The Walsh and Loomis model, according to their evaluation of the method, is "based on specific assumptions and judgements affecting the questionnaire design and data analysis". The model is also limited by people's income and ability to pay. The "satisfaction from preservation may be worth more than people are willing and able to pay (Walsh and Loomis, 1988)".

The model quoted above was developed in heavily populated areas in the United States, and may not reflect local conditions in northwestern B.C.. For the model to work well, people must have some understanding of what they are being asked to value. Although such a model may well be modified to account for wilderness values in the region, the conclusions could be misleading and underestimate the true value of wilderness. Public understanding of the Tatshenshini-Alsek wilderness from a biological perspective is limited, simply because the information is not available. Any accounting measure completed now could misrepresent the value of wilderness in the region.

The model is also limited in that it does not incorporate non-human ecological values nor does it capture all of the complexities of subsistence or lifestyle use values. Humans value the preservation of wilderness and of wildlife species such as grizzly bears for their own sake (ie. existence values), but the model does not assess how grizzlies value their existence or the wilderness they reside in. Many people believe other living things have values outside our own that also must be taken into account as an important non-economic value.

Controversy remains over economic valuation and its ability to assess the true value of wilderness: the economic valuation methodologies described here may not capture the full value of wilderness. McCloskey, (1988) feels that non-market evaluation is "imaginary". At best, Walsh and Loomis (1988) suggest that "economic values are a conservative estimate of the total benefits to society from protecting wilderness resources."

6.5 ECONOMIC ASSESSMENTS RELATED TO WILDERNESS IN THE STUDY AREA

6.5.1 In the Province

About $1.5 billion is spent annually on recreating in provincial forests (Ministry of Forests, 1991). Although there are no B.C. communities in or near the study area, residents of the Prince Rupert forest region spend the most, per household, on wildlife viewing, fishing and hunting. Non-consumptive wildlife viewing, while not related solely to wilderness, is worth more than $2 billion annually in the Canadian economy, while in B.C. millions of dollars are spent annually on viewing (Filion et al, 1983, Ethos et al, 1988).

On a province-wide basis, the Ministry of Forests found that British Columbians are willing to pay more than $113 million annually to protect recreation resources in provincial forests (Ministry of Forests, Recreation Branch, 1991). Adult residents on average would pay about $54 annually to ensure the preservation of provincial forest recreation resources. On a

regional basis, adults in the Prince Rupert Forest Region are prepared to pay the second highest amounts, at $68, next to those living in the Nelson region. Furthermore, British Columbians place a high value on nature study, including activities such as scenic and wildlife viewing and photography (Ministry of Forests, Recreation Branch, 1991). Adult residents on average would spend $139 annually to participate in nature study activities in provincial forests.

The Ministry of Forests survey also found that provincial residents place the highest preservation values on primitive and semi-primitive (ie. roadless) recreation opportunities as defined by the Recreation Opportunity Spectrum. Finally, one-third of all outdoor recreation occurs in roadless areas. This survey establishes the fact that residents of British Columbia value their wilderness, outdoor recreation activities, and non-consumptive use of natural resources.

The above survey values recreation resources in provincial forests and does not address the many non-recreational values associated with wilderness. Therefore, the Ministry of Forests, in cooperation with other provincial and federal resource agencies is developing a provincial wilderness survey to assess the use and value of wilderness.

6.5.2 Previous Studies in the Region

Geddes Resources assessed the Canadian revenue for direct recreation use on the Tatshenshini River at $300,000-$500,000 per annum, with a total direct expenditure estimate of $830,000. Using a model developed by Walsh et al (1985) the actual expenditures were estimated to be worth about 19% of the "gross" economic value to society, of retaining the river in a wild state. The remaining 81% was estimated to account for non-use preservation values (option, existence and bequest values). The Geddes report estimated the gross value to Canadian Society of the Tatshenshini Valley and area as $1.6 to $2.65 million annually, or about $4.4 million including value to Americans.

The Tatshenshini issues summary prepared by Tatshenshini Wild (1989), questions these figures, pointing out that use and direct expenditures have increased since the original data were collected. A non-use preservation value of $11 million annually was calculated by the Wilderness Tourism Council, based on comparable rivers elsewhere. The Wilderness Tourism Council also suggested that the value of the advertising image used by B.C. for the international promotion of the province's wilderness was in the order of $470,000 (Tatshenshini Wild, 1989). These various estimates of different recreation and non-use values total more than $13.4 million annually. This estimate focussed solely on river rafting.

These previous assessments (Geddes, 1990 and Tatshenshini Wild, 1989) do not include wilderness preservation values that may not be associated with wild river preservation values, subsistence economic values, and local recreation and commercial use values such as guide-outfitting along the Haines Road and in the Tatshenshini-Alsek corridor. No direct assessments of non-use preservation values of the Tatshenshini-Alsek region have been made. Because of the national and international significance of many of the wilderness resources in the region, these previous assessments may very well have undervalued the resource. Furthermore, these previous assessments have extrapolated values determined in other jurisdictions without adjusting the methodology to the northwestern B.C. conditions. If all of these factors are addressed, a more accurate but still conservative estimate of the economic value of the Tatshenshini-Alsek wilderness could be made.

The previous estimates also under-value the Alsek River contribution to market and non-market values. The Alsek River features are different but at least equal in stature to the

biological, recreation, scenic, and landform features in the Tatshenshini River valley. Part of the Alsek River flows through Kluane National Park, itself an international destination.

6.5.3 The Situation Now

The following section discusses some of the economic values and impacts related to wilderness resources in the region. No attempt was made, however, to estimate the net economic benefits or values to the province.

River Use

One of the expenditures incurred in wilderness use is the fee paid to commercial river raft guides. These fees represent the gross revenues of the guides. Total potential recreation revenue from direct recreation use by wilderness raft trips on both the Tatshenshini and Alsek Rivers, including American companies is now assessed at $2,088,000 per annum. This revenue is based on a full capacity of 58 commercial departures (already approved for 1992) with an average of 18 clients per trip. (The 58 allows for unused private trip capacity to be used by commercial guides). Assuming half of these trips are offered by Canadian companies, the total annual Canadian revenue from commercial parties will be in the order of $1,044,000 per annum. An additional revenue source is generated by Yukon companies providing 12 day-rafting departures with 20-25 people each on the upper Tatshenshini River, with an estimated $22,000 per annum in receipts. Total direct Canadian revenues from commercial rafting are therefore in the order of $1,066,000 per annum.

Private trips account for a potential 20-25 parties now, but could be as high as 36 in the future, based on present management agreements with Glacier Bay National Park. Other studies in B.C. have used a conservative estimate of 10% of commercial revenues on a per head basis to estimate the direct revenues from private trips. This figure is too low for the Tatshenshini-Alsek. The high cost of flying out of the Alsek River mouth probably increases this factor, in comparison to other B.C. rivers, and a figure of 20% is more reasonable. These parties may purchase food, accommodation, gasoline, transportation, rental equipment, and other goods on their way to the adventure travel trip and while spending time in northern B.C. and the Yukon.

Direct total Canadian and American revenues from private parties, based on an average group size of 8-10 people could be in the order of $80,000 annually now, with growth potential to $144,000. About half of this could be Canadian revenues. These figures are based on 20 private parties of 8-10 people each per year, paying out about $400 each for their trip, exclusive of air travel to the region and incidental food and accommodation costs in the region.

Direct revenues received by Canadian guides are about $1,066,000 annually, derived from rafting the Tatshenshini and Alsek Rivers. At least 80% of these revenues go to B.C. rafting companies. This estimate does not include multiplier effects in communities such as Whitehorse, where rafters also spend money. Northern B.C. communities do not benefit directly from rafting on the Tatshenshini or Alsek Rivers. Using a multiplier of 1.5, an estimate of $1.6 million annually is generated in Canada from tourists travelling on the Tatshenshini-Alsek Rivers. High air travel costs to Whitehorse may increase this estimate. The total direct economic impact from rafting, including Canadian and American revenues, is in the order of $3.16 million annually.

Haines Highway

The Haines Highway is one of the most scenic in the province. As a route to the Alaska Highway, the highway is not widely known as a destination on its own, except for regional residents who regularly visit for a variety of pursuits including wilderness hiking, mountaineering, ski touring, snowmobiling, hunting, and other activities. Each of these activities depends to a varying degree on the wilderness and scenic qualities in the study area, and each provides revenues for businesses in Haines Junction and Haines.

The Haines Highway corridor is, however, an important destination for birders who visit annually to view birds along the 'sea to sky' route. This activity depends on the unique environmental characteristics of the corridor, and provides direct revenues to both Canadian and American businesses. Viewing wildlife is a very important revenue generator in nearby Haines, because of the Chilkat Eagle Preserve. Many of the birders visiting the B.C. portion of the Haines corridor also visit the Chilkat Eagle Preserve. Swiftsure Tours conducts birding tours in the region.

No data are available on the economic values derived from the Haines Highway as a tourist or wildlife viewing route.

Chilkat Eagle Preserve: A Regional Example

About 34,200 people visit the nearby Chilkat Eagle Preserve each year, with as many as 20% arriving in winter during the best viewing season. Winter and summer use are increasing annually. The Chilkat bald eagle visitors spend $1,422,736 in Haines annually, or about 48% of total visitor expenditures (Stouffenburg, 1991). In other words, almost half of the tourist industry dollars in the Haines region are associated with fish and eagle populations. Although no direct parallels may be made for the B.C. portion of this area, it points out the potential for wildlife and wilderness-associated tourism in the area. Many of the people visiting the Chilkat Eagle Preserve also travel north to B.C. and the Yukon, watching birds, looking for other wildlife and spending money in communities. While no wildlife spectacle similar to the Chilkat Eagle Preserve is visible in the study area, visitors may see Dall's sheep, goats, and several unusual bird species along the corridor.

Guide-Outfitting

The Tatshenshini-Alsek area supports one commercial big game guide-outfitter. Each year about 25 clients depend on and pay for a wilderness experience as well as the opportunity to hunt for species dependent on or associated with wilderness. This activity should be included in an overall assessment of market and non-market values dependent on wilderness. Direct revenue estimates from guide-outfitting are based on 25 hunters for an average of 12 days at $450 per day, for a total of $135,000 annually. A multiplier of 1.5 suggests local revenues of about $202,500 annually from non-resident hunting. The province takes trophy fees of about $350 per head for a total of $8,750.

On a regional basis, the northwest guide-outfitting industry contributes $4.8 million in income, $3.3 million in wages and salaries, and 170 person years of employment (Ethos, 1991).

Commercial, Sport and Subsistence Fishery

The gross value of the U.S. commercial fishery at Dry Bay is now about $270,000 annually, but if planned fishery recovery programs are successful, the figure could exceed $500,000 annually (U.S. Department of Interior, 1990) While the commercial fishery is not dependent on wilderness, habitat integrity is crucial. The fishery can be classed as a commercial production value of wilderness. Wilderness values such as wildlife viewing also depend on the health of fish populations and fish habitat.

The value of the sport and food fishery in British Columbia, the Yukon and Alaska is substantial, but not well understood. The most recent comprehensive economic assessment of the resident and non-resident sport fishery in the Yukon found significant expenditures on travel, equipment, rentals and fishing licences (Sinclair and Sweitzer, 1973). The study estimated the net economic benefits generated by the Yukon sport fishery for the Yukon and Canadian economy. The upper Tatshenshini River tributaries support an important subsistence fishery, but the economic value of this fishery has not been assessed.

Table 5 summarizes the known data on revenues and values related to the wilderness resources in the study region. The table effectively illustrates what is not yet known, and points to the need for further research. Most of the activities listed are provided on a commercially guided basis as outlined above, but little information is available now to determine their economic impact. The estimate for non-use preservation values is based on previous work by others and is included only to show the substantial potential value (Tatshenshini Wild, 1989). Further research is required to determine if this figure reflects the true non-use value placed on the region by B.C. residents.

Table 5: Annual Wilderness-Related Gross Revenues or Values in Study Region*

Activities and Non-Use Values	Canadian** Revenues (B.C. and Yukon)	Total Direct Revenues (U.S. and Canada)	Net Economic Value (B.C.)
Wilderness Uses:			
Commercial Wilderness River Trips	$1,044,000	$2,088,000	?
Private Wilderness River Trips	$40,000	$80,000	?
Day River Trips	$22,000	$22,000	?
Total River Trips	$1,106,000,	$2,190,000	?
Non-Resident Hunting	$135,000	$135,000	?
Resident Sport Hunting	?	?	?
Sport Fishing	?	?	?
Wildlife Viewing	?	?	?
Scenic Viewing	?	?	?
Mountaineering	?	?	?
Hiking	?	?	?
Skiing	?	?	?
Snowmobiling	?	?	?
Highway Touring	?	?	?
Subsistence Fishing/Hunting	?	?	?
Commercial Fishing	$0	$270,000	?
Trapping	$6,000	$6,000	?
Non-Use Preservation Values:	Not Applicable	Not Applicable	$11,400,000***

* This summary does not estimate net economic benefits (the economic value of the wilderness after costs of maintaining the resource are taken into account).

** 80% of the Canadian wilderness rafting revenues can be assumed to be generated by B.C.- based companies. All of the guided hunting revenues are derived from a B.C. company.

*** This is a very rough approximation only based on suggestions made by Tatshenshini Wild, as discussed in Section 6.4.2

6.6 RESEARCH NEEDS

Direct wilderness revenues from rafting and guide-outfitting are reasonably well understood. Our knowledge of the regional, provincial and national economic benefits of wilderness resources in the area, however, is incomplete. Previous assessments have not been comprehensive or detailed. As the region's biological resources become better understood and known by the public, the wilderness may attain a higher non-use preservation value than it already has.

Further economic research can provide a better understanding of the economic value of wilderness resources in the region.

Recommended research includes:

- conduct a comprehensive economic valuation and impact assessment of wilderness resources;
- modify existing methodologies as required to assess non-use preservation values in the region;
- assess regional tourism economic impacts of wilderness preservation;
- assess net economic and social benefits to region and province of retaining the area in wilderness.

Rafting party unloading at one of the gravel bar campsites. Creek fans support dense dryas meadows. (J. Peepre)

Tats Lake, near the site of the windy Craggy mineral exploration area. (M. Murtha)

Steep canyons along Tat Creek. (T. Vold)

Shore of Tat Lake with Noisy Ranges in distance. (T. Vold)

7.0 LAND USE AND JURISDICTION

Many of these uses are described elsewhere in more detail under recreation uses and native heritage. These land uses and jurisdiction are summarized here, since they all have a bearing on wilderness values. Many of these land uses are consistent with wilderness preservation, others are less compatible. (See also Map #4 showing place names, land uses and old roads described here.)

7.1 EXISTING LAND STATUS

The study region lies entirely on Crown Land, but many of the natural resources are transboundary in nature. See Adjacent Jurisdictions, below.

7.2 NATIVE USES, LAND CLAIMS

Subsistence use in the upper Tatshenshini-Alsek Rivers and along the Haines Corridor has occurred for centuries. Hunting, fishing, trapping, berry-picking and other types of harvesting continue today. The Champagne-Aishihik First Nation has filed a land claim with the federal government, covering parts of the study area.

7.3 FISHING

Subsistence, commercial and recreational fishing take place in the Tatshenshini-Alsek River area. The 1980-1988 harvest from commercial nets at the mouth of the Alsek averaged 17,000 sockeye salmon , 5,700 coho and 103 Chinook salmon. In addition 2,100 sockeye salmon were harvested annually from the Canadian in-river food fishery (Geddes Resources, 1990). In 1991 the Dalton Post area food fishery was estimated to yield 2,013 sockeye salmon, 440 Chinook, and 116 coho. The ten year average is estimated to be 2,163 sockeye salmon and 174 Chinook (Department of Fisheries and Oceans, 1992, in prep.). These estimated are judged to be conservative due to the sampling techniques used.

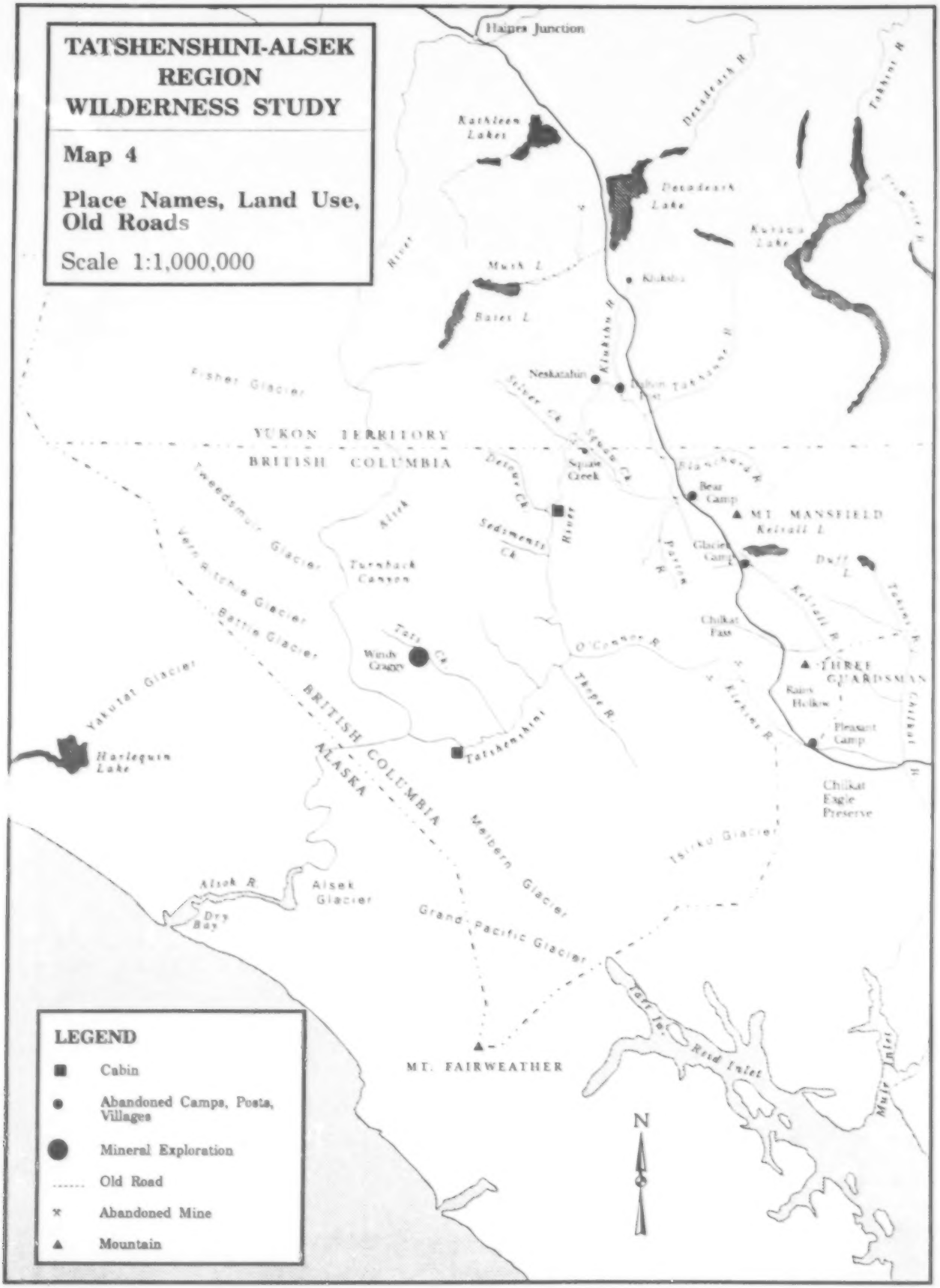
The 1985 Pacific Salmon Treaty governs harvest sharing and management in transboundary river systems such as the Alsek/Tatshenshini Rivers.

7.4 HUNTING

One big game guide-outfitter operates in the study area, Northwest Big Game and Outfitters Ltd. of Atlin , B.C. Residents and non-residents also hunt along the Haines corridor. The area lies in Management Unit 6-29 of the Skeena Sub-Region, administered by the Ministry of Environment. Hunting seasons exist for sheep, mountain goat, moose, grizzly bear, black bear, gray wolf, coyote, lynx, wolverine, waterfowl, grouse and ptarmigan.

7.5 TRAPPING

Champagne-Aishihik First Nation members have traditionally trapped in the study area, with the Pringle, Hume and Kane families using the region during their seasonal rounds. The trapped from Kusawa Lake to points south in British Columbia (Gaunt, pers. comm.).


TATSHENSHINI-ALSEK REGION WILDERNESS STUDY
Map 4
Place Names, Land Use, Old Roads
Scale 1:1,000,000
Haines Junction
Kathleen Lakes
Dezadeash R.
Dezadeash Lake
Takhini R.
Kusawa Lake
Kusawa R.
Aishihik R.
Aishihik Lake
Klukshu
Bates L.
Neskataheen
Klukshu R.
Takhanne R.
Fisher Glacier
Silver Ck.
Spruce Ck.
YUKON TERRITORY
BRITISH COLUMBIA
Dezadeash R.
Bear Creek
Bear Camp
MT. MANSFIELD
Kelsall L.
Alsek River
Sediments Ck.
Glacier Camp
Duff L.
Kelsall R.
Takhini R.
Tweedsmuir Glacier
Turnback Canyon
Alsek R.
Battle Glacier
Chilkat Pass
Tats Ck.
Windy Craggy
O'Connor R.
THREE GUARDSMEN
Kaiser Hollow
Pleasant Camp
Chilkat Pass
Tatshenshini R.
Kirkham Ck.
Yakutat Glacier
Harlequin Lake
BRITISH COLUMBIA
ALASKA
Tatshenshini
Chilkat Eagle Preserve
Alsek R.
Dry Bay
Alsek Glacier
Malaspina Glacier
Grand Pacific Glacier
Icy Bay
Taylor Inlet
Reid Inlet
Muir Inlet
MT. FAIRWEATHER
N
LEGEND
Cabin
Abandoned Camps, Posts, Villages
Mineral Exploration
Old Road
Abandoned Mine
Mountain

One trapline is operated now in the study area, west of the Haines Highway. Another lies east of the highway. Neither have the reputation of being highly productive on a regional basis, but are important to the individuals operating them.

7.6 RECREATION

Dispersed outdoor recreation occurs throughout the study area and is described in Section 5.0. The Tatshenshini-Alsek Rivers draw an international adventure tourism clientele in summer. Most other recreation takes place along the Haines corridor, with both winter and summer use. Recreation use is most concentrated at Dalton Post/Shaw'ashe, in the Yukon.

7.7 MINERAL CLAIMS

Mineral claims are located throughout the study area, with most along the Haines Highway and westward, in the Squaw Creek area and the Windy Craggy site. Placer claims are located along the Tatshenshini River in the Yukon, but placer claims are not permitted on the B.C. portion of the Tatshenshini or Alsek Rivers.

Claims themselves may not affect wilderness values. Past and present exploration roads and placer operations affect aesthetic quality along the upper Tatshenshini River. Potential affects of existing roads on other wilderness values are unknown. The affects of the existing Windy Craggy mineral exploration site were not assessed for this report.

7.8 GOVERNMENT RESERVES AND INTERESTS IN THE STUDY AREA

(See also Adjacent Jurisdictions, Section 7.11)

A Land Act Reserve is in place on lands adjacent to the Tatshenshini River, preventing any land alienation. B.C. Parks has held a reserve in the Haines Corridor since 1968, The reserve covers the height of land on either side of the highway from Alaska to the Yukon border.

The Department of Environment has a reserve over the Tarr Inlet area, put in place by Order-in-Council in 1925. The reserve is held in the name of the Canadian Parks Service today.

B.C. Parks, in conjunction with other ministries has, in the past, proposed an Ecological Reserve in the Mt. Mansfield area on the east side of the Haines highway. The Haines corridor and the Tatshenshini-Alsek River areas are now park study areas. The Ministry of Forests has a wilderness study area in the vicinity of the Alsek-Tatshenshini confluence. The International Union for the Conservation of Nature (IUCN) has nominated the Tatshenshini-Alsek region as a National Park (IUCN 18th General Assembly, 1991).

The Canadian Parks Service studied the possibility of extending Kluane National Park into the lower Tatshenshini-Alsek area in the mid-1970s. The lower Tatshenshini-Alsek was considered because it would have provided better ecosystem representation of the natural region. It was felt that such an addition would be the northernmost sample of the Coast Forest Ecosystem in Canada, as well as add a potential Marine Ecosystem Theme, and Marine Fauna Spawning Area secondary theme (B.C. Parks Files, Prince George).

7.9 LOTS, LEASES, LICENSES, INTERESTS AND RIGHTS

Northwest Big Game and Outfitters Ltd. of Atlin , B.C., have applied for a lot lease at Detour Creek on the Tatshenshini River. The company has erected a new cabin, for use as a guide-outfitting base, adjacent to a previous cabin on the site. Neither occupation is legally permitted at the time of this report. A second cabin operated by the same company is located on the lower Tatshenshini River, near the Melbern Glacier. This cabin is also on vacant crown land.

Highway camps, micro-wave tower sites, borrow pits and other service and maintenance operations are located along the Haines corridor.

7.10 ROADS, PIPELINES, AIRSTRIPS

The Haines Road was built in 1942-43 shortly after the construction of the Alaska Highway. It was upgraded in the 1980s. The Haines-Fairbanks oil pipeline was built in the 1950s, then abandoned in 1968, but dismantled only recently. The right-of-way is still visible.

Short exploration and mining roads and access roads to borrow pits are located along the Haines Highway. The longest of these is the old road to the O'Connor River Gypsum project. Old roads are also located in the Squaw Creek area, at Dalton Post/Shaw'ashe and to Kelsall Lake. A rough airstrip, condition unknown, is located on the O'Connor River. An airstrip is also located at the Windy Craggy exploration site.

7.11 ADJACENT JURISDICTIONS

7.11.1 United States and Canada

The study region is bounded by two National Parks, a National Forest, and is near the Chilkat Eagle Preserve. The U.S. National Park Service has a mandate to cooperate with Canada, "to protect the entire watershed of the Alsek River...and its environs" (ANCILCA, 1980). Regional cooperation in resource management and visitor management has proven to be beneficial.

7.11.2 Kluane National Park Reserve

Kluane National Park Reserve in the Yukon, was established in 1972, protecting a portion of the Alsek River as well as much of the St. Elias Range. The park protects part of Region 6 (Northern Coast Mountains) as classified by the Canadian Parks Service.(See also Chilkoot National Historic Park, 7.11.8).

Kluane National Park is a World Heritage Site, and 90km of the Alsek River within the park boundaries is designated a Canadian Heritage River. The national park was established to protect part of the largest non-polar ice-cap in the world as well as diverse wildlife and plant species in the mountain ranges around the icefields. The Alsek River was designated a Canadian Heritage River to recognize nationally significant cultural and natural features, such as Lake Alsek created by the Lowell/*Naludi* Glacier ice-dam. International Biosphere Program (IBP) sites were also established earlier in the Kluane area to acknowledge the calving glaciers, diverse coastal flora and relect grassland (Parks Canada, 1985).

Kluane supports an unusual diversity of plants and animals for such a high latitude because species from several different overlapping biomes are found here, some at the northern or southernmost limit of their range (Parks Canada, 1985) The Tatshenshini-Alsek study area is within this region of unusual diversity, but has a greater coastal influence with conditions not found in Kluane. As noted above, in the mid 1970s the Canadian Parks Service studied the merits of adding the lower Tatshenshini-Alsek areas to the National Park Reserve.

The main management objective of the park is to protect the wilderness character. The Alsek River and its environs are designated by the Management Plan as a Zone II (Wilderness) in the lower reaches, and a combined Zone I (Special Preservation) and Zone II (Wilderness) in the upper reaches. The Special Preservation zone is intended to protect grizzly bears.

The park does not restrict use of the upper Alsek River now, and no restrictions are anticipated. Commercial permits have been issued for rafting trips on the Alsek River, allowing for helicopter support around Turnback Canyon. About 15 parties per year now fly around the canyon. Jetboat and hovercraft concessions are under negotiation on a trial basis. Flight-seeing occurs in the park. The park is encouraging rafting trips to the Lowell/*Naludi* Glacier, with a return flight from a gravel bar air strip. Two to three day commercial trips may be offered in the future, taking out at either the Lowell/*Naludi* or Tweedsmuir glacier. Aircraft support will be required for these excursions.

7.11.3 Adjacent Yukon Lands

The portion of the Tatshenshini River in the Yukon has no formal protection at the time of writing, but lies within the land claim area of the Champagne-Aishihik First Nation. At the time of report writing, no restrictions on mineral or placer claims are in place. (B.C. has established a 500m reserve to prevent placer claims in the lower Tatshenshini watershed). The Yukon government has requested a withdrawal from staking in the past, but the request was deferred by the federal government pending land claims agreements. The lands within the Yukon may also be subject to the Greater Kluane Land Use Plan, not yet approved by the Federal or Yukon government. The final provisions for possible land use management in the area are not yet in place.

The relevant recommendations in the Kluane Land Use Plan are:

> *The southern portion of the sanctuary ... should be managed as a park. A park management plan ... should address the protection of the wilderness character of the Tatshenshini River. The management plan should also address multiple issues related to the Indian food fishery, sport fishing, the regulation of recreational use of the area, the protection, interpretation and management of heritage resources and mining.*

The Yukon is actively pursuing possible Canadian Heritage River status for the portion of the Tatshenshini River in the territory, with background studies to begin in 1992. Possible changes in the status of the Kluane Game Sanctuary, and the boundaries of Kluane National Park are also under review as part of the land claims process. These changes may have some bearing on the status of lands in the Tatshenshini watershed.

The Yukon also manages a territorial campground and day use area at Million Dollar Falls on the Takhanne River, a tributary of the Tatshenshini River. Dalton Post/Shaw'ashe has a territorial heritage site sign but no formal designation as such. The site has been managed on an ad hoc basis, without any designation or official agreement, by the Yukon Parks and

Outdoor Recreation Section. Final designation and management of this site will be determined as part of the land claims process.

7.11.4 Glacier Bay National Park and Preserve

Glacier Bay National Park was established to protect tidewater level glaciers, outstanding diversity of forest cover, bird migration routes, wildlife and fish habitats, scenery, and to provide opportunities for scientific research. The National Park and Preserve is managed in accordance with the National Park Service Act and the Wilderness Act as well as other mandates (Alsek River Visitor Use Management Plan, 1989). The Alsek River and Dry Bay are in the "Preserve" portion of the protected area designation. This designation provides incomplete protection and allows for commercial fishing. The wilderness values in the park are legally protected by these acts and the management policies listed in the park management plan. Key management objectives related to wilderness are to:

- insure that overuse of the Alsek River does not occur,
- ...protect the quality of the wilderness river experience,
- monitor the effects of human use on the resources and park values,
- ensure that other legitimate uses of the Alsek River, including commercial fishing and subsistence, are not detrimentally affected by recreational activities.

Furthermore, the Alsek River watershed within Glacier Bay National Park is designated as a pristine Zone 1 (Alsek River Visitor Use Management Plan, 1989). In this zone the plan states that resource effects from visitors will not be apparent, and that human effects on wildlife will be "too slight to be biologically significant". The plan is based on one launch per day, where groups are able to "camp out of sight and sound of each other and to encounter no more than one different party along the river during the day for 90% of the groups". Exceptions to these objectives are acknowledged for the most popular campsites such as Walker Glacier or Alsek Lake spit.

A hunting lodge and two sport fishing lodges provide overnight accommodations and food service at Dry Bay. Access in and out of Dry Bay is by air only.

The total number of commercial and private permits will be limited to 36 each for a total of 72 between July 1 and September 10. A proportion of excess demand by commercial groups may be shifted to the private allocation until such time as private users would need all available trips. Commercial group size is limited to 25 people and private group size to 15.

Current regulations and instruction in minimum impact travel are intended to ensure that "natural life processes prevail throughout the Alsek River watershed." Recreational use has resulted in some physical and biological impacts, for example improper human waste disposal, litter, vegetation loss, water pollution and disturbance of wildlife (Alsek River Visitor Use Management Plan, 1989).

7.11.5 Tongass National Forest

Tongass National Forest in Alaska, lies west of the Alsek River and extends to the Gulf of Alaska. The National Forest is adjacent to Glacier Bay National Park and Preserve. The U.S. Forest Service has no jurisdiction over Alsek River users, but manages coastal ecosystems that are part of the regional wilderness mosaic.

7.11.6 Wrangell-St. Elias National Park

This U.S. National Park park lies immediately west of Kluane National Park Reserve, forming part of the World Heritage Site and protecting part of the St. Elias Mountains.

7.11.7 Chilkat Eagle Preserve

The Chilkat Eagle Preserve in Alaska protects habitat, and resident as well as seasonal populations of the bald eagle. The Preserve on the Chilkat River is downstream from the Klehini and Kelsall Rivers in B.C. The Bald Eagle Protection Act provides additional protection for the eagles in the area.

7.11.8 Chilkoot National Historic Park

Chilkoot National Historic Park is located east of the study region, but within Natural Region 6 as defined by the Canadian Parks Service. The park protects the cultural resources of the Chilkoot Trail, although the park boundaries include a 135 km^2 representative example of alpine tundra and sub-alpine forest in coast mountains as well as forested transitional and interior ecosystems. The Alaskan side of the Chilkoot Trail is a designated National Historic Landmark. With the combined protected Alaskan state lands and Canadian park lands, the 50km protected area represents a complete, if narrow, ecological cross-section from sea level over Chilkoot Pass to Lake Bennett in the interior. Much of this cross-section was disturbed during the gold rush, for example by the removal of most of the forest in the Lindeman and Bennett areas.

The main purpose of the park is to protect the Chilkoot Trail and its artifacts as part of the Klondike gold rush theme. The Dalton/Chilkat trail to the west, and in the study area, was one of the alternate routes to the gold fields, as described in the report.

7.12 RESEARCH NEEDS

This study concludes that no further land use research is required to assess wilderness values. If, however, land use decisions are to be made, more detailed information on mineral claims, the impact of roads on wilderness resources and adjacent jurisdictions, and other resource values would ofcourse normally be obtained. This report is not intended to address resource and land use decisions.

Applied research to determine the impacts of land uses, such as recreation, on the wilderness environment would be useful but not critical in the next two to three years.

8.0 WILDERNESS SIGNIFICANCE

8.1 CRITERIA FOR MEASURING SIGNIFICANCE

The natural and cultural resources in the Tatshenshini-Alsek region collectively define many wilderness values described in this report. Human appreciation of the region adds the dimensions of wilderness recreation, adventure tourism, ecotourism, commercial and subsistence harvesting of natural resources, as well as the non-use values associated with the wilderness idea. *How significant is the Tatshenshini-Alsek wilderness in the region, in the province, in Canada and worldwide?*

The answers are, at least in part, qualitative, mainly because the ecology of the region or the importance of its cultural resources are not well understood. Any measure of wilderness significance is prone to cultural biases, unless native and Euro-Canadian views are merged.

In spite of these limitations, the question of significance is pertinent, and can be addressed using a combination of established criteria. The criteria are divided into three categories: objective criteria based on measurement of wilderness resources; criteria determined by various agencies for different types of wilderness or protected area designations; and qualitative criteria, such as appeal to visitors. The use of various criteria applied by agencies to determine significance does not infer that wilderness protection or any particular protection mechanism is recommended. These criteria are provincially, nationally and internationally known. Here, they are a means to place the study area into a context from as many different perspectives as possible.

A further important distinction in assessing the significance of wilderness resources relates to "scientific" versus "interpretive" interest. For example, the geology of parts of the study region may not have great significance from a scientific research point of view, but be important as one of the few places in British Columbia where complex coastal geologic processes can be readily interpreted in a wilderness setting. Recreation or interpretive resources add a human dimension to the wilderness, lending significance to what may be viewed by some as scientifically mundane.

8.2 PREVIOUS WORK ON SIGNIFICANCE

The literature provides some guidance in determining "significance". Bourdages et al (1992) developed a system of ranking areas based on ecological value. The approach is based on mapping ecological units with weighted criteria assessing uniqueness, representativity, sensitivity to disturbance, species richness, species rarity, community composition and global ecological value.

Mondor (1992) describes a system of ranking natural areas also using a weighted score for various criteria. This method can be used to compare similar areas, for example the Stikine and Tatshenshini Rivers. The system assesses eight factors: representativeness, naturalness, special biological features, special earth science features, historical cultural diversity, ecological integrity, public understanding and public enjoyment.

The IUCN (Resolution No. 18/47, 1990) has emphasized the importance of protecting biodiversity and suggests that "diversity, including species and habitat richness, representativeness and scarcity is a fundamental principle" in identifying potential protected areas. Mapping methods for identifying areas of high biodiversity have been developed, using

grid cell mapping, ecodistrict map analysis and spatial analysis using a geographic information system (Mondor, 1992).

Other "significance" criteria used in British Columbia have been described for each of the wilderness resources outlined in this report. Recreation feature significance, scenic quality, tourism capability, and other resources can be measured with varying degrees of objectivity. A composite of significance ratings helps determine the overall significance of a wilderness area such as the Tatshenshini-Alsek region. Table 6 summarizes these wilderness attributes.

8.3 QUESTIONS AND ANSWERS: PRELIMINARY CONCLUSIONS

Twenty-nine questions were asked and answered to help assess the overall significance of the Haines Triangle and Tatshenshini-Alsek wilderness. The answers are the conclusions of this study: they are a summary of what is known now about the wilderness attributes in the region. These preliminary conclusions are a mix of both quantitative and qualitative conclusions. As more information is revealed by further research, these conclusions may be confirmed or changed. These conclusions do not recommend a land use or designation strategy, but place the study region in context from several different perspectives.

Table 6, following this list of questions, shows the study conclusions in matrix format. Question marks show where insufficient information is available to assess significance.

The question and answers:

1. Is the wilderness intact and do natural processes occur without noticeable influence by humans?

   Wilderness and natural processes are largely intact in most of the study area.

2. Are the ecological conditions in the area unique to the province, to Canada, the world?

   Ecological conditions are unique in the province and Canada.

3. Do ecological conditions in parts of the study area occur elsewhere in the region?

   The ecological conditions in the lower Tatshenshini-Alsek and Haines corridor do not occur elsewhere in the region.

4. Does the area support an unusual biodiversity?

   The area has unusual biodiversity for such a high latitude due to the influence of several different biomes converging in an area affected by coastal conditions. Wilderness-dependent and wilderness-associated species also increase the region's biodiversity, and the area contains several known rare and relect plant species.

5. Are there rare, threatened, endangered or unusual species in the area?

   There are known rare and unusual species in the area, with an unknown number of as yet unidentified species. Some species, such as the grizzly bear, may depend on wilderness habitat. Plants rare to B.C. are found in the study area.

6. Are the biological values sensitive to human impacts?

   Wilderness-dependent species such as grizzly bears, blue glacier bears, and mountain goats are sensitive to human impacts. It is not known which other species in the region are wilderness-dependent.

7. Is the ecoprovince, ecoregion or ecosection represented in protected areas elsewhere?

   The Alsek Ranges Ecosection, (the lower Tatshenshini-Alsek confluence area) are not represented by protected areas elsewhere. The Icefield Ranges Ecoregion is represented in Kluane National Park, but not in British Columbia.

8. If the ecoregion is protected elsewhere, is it adequately represented?

   Kluane National Park and Glacier Bay National Park do not protect the transitional conditions found in the study area. Kluane National Park does not protect a complete representative example of Natural Region 6, since the Alsek Ranges ecosection is not in the park. Chilkoot Trail National Historic Park also protects a narrow band of Region 6, but these lands were extensively disturbed during the gold rush.

9. Are the geological or geomorphological features or processes of regional, provincial, national or international significance?

   Physical landform processes and features are nationally and internationally significant.

10. Are the cultural resources of regional, provincial, national or international significance?

    The known cultural resources are regionally and provincially significant. The early native history of trade, travel and linguistic groups has a high interpretive value. The history of European exploration and development is territorially and provincially significant. And todays cultural diversity is a rich part of the region's human resource. Nearby Chilkoot Trail National Historic Park protects historic resources related to the Klondike gold rush, but its role in representing native heritage is not yet well understood.

11. Do the wilderness resources contribute to the subsistence economy of native people and other local residents?

    The wilderness resources contribute to the subsistence economy, by providing habitat, wildlife and fish populations for harvesting.

12. Is the study area part of the traditional homeland of natives peoples?

    Much of the area is part of the traditional territory of the Southern Tutchone, with the nearest group now called the Champagne-Aishihik First Nation. Coastal Tlingits also traded in the area, contributing to the cultural diversity of the region.

13. Does the wilderness support industries dependent on the wilderness character and natural resources?

    Commercial rafting and guide-outfitting depend on wilderness resources and wilderness character. The commercial fishery (although in itself not considered compatible with wilderness by some) depends on the integrity of fish habitat and water quality. The tourism industry of Haines depends on the continued integrity of eagle habitat and populations.

Guided mountaineers, wildlife viewing and touring are all linked to wilderness resources in the region.

14. Does the study area have the ability to attract visitors from international, national, provincial or regional markets?

The Tatshenshini-Alsek Rivers attract international visitors. On a smaller scale, Mt. Fairweather and the Haines Highway also attract regional, provincial, national and international visitors.

15. Does the scenic quality or opportunity for nature study attract visitors from distant markets?

Scenic quality is one of the main motivations to visit the region. The ecotourism potential of the region has been realized in part on the Tatshenshini-Alsek Rivers, but not in the region as a whole.

16. How are scenic quality and visual sensitivity rated in the region?

The study region has the highest possible ratings for scenic quality and diversity, as well as high visual sensitivity and low visual absorption capacity ratings for many areas.

17. Is recreation in the area wilderness-dependent?

Multi-day rafting, kayaking, hiking, horse-back riding, mountaineering, and winter recreation activities are wilderness-dependent.

18. Are similar wilderness experiences provided elsewhere in the province, country, or world?

No other river in British Columbia or Canada provides a similar length of wilderness experience in an interior to coast landscape. The river is ranked as one of the top 14 rafting rivers in the world.

19. Does the area have a high wilderness tourism resource capability?

The region has a high wilderness tourism capability as shown by the international clientele, and as verified by using different provincially defined rating methods.

20. Does the region support many different types of adventure or wilderness tourism products?

Yes, some of which remain undeveloped.

21. Does the regional economy rely in part on wilderness resources?

The Yukon and nearby parts of Alaska benefit from the wilderness resources in the study area.

22. Does the provincial economy benefit from the wilderness resources?

Yes, to an unknown extent. The economic benefits of rafting and guide-outfitting are described in this report, but are only a fraction of the overall economic benefits derived from wilderness in the region.

23. Are the tourism products wilderness-dependent?

Yes, particularly for the Outdoor/Adventure segment.

24. Which resource attributes are important to enjoyment of the experience sought?

Wilderness, scenery, glaciation and mountains, wildlife, biological diversity.

25. Does the area have recreation features of provincial or national significance ?

Recreation features of provincial and national significance are well documented.

26. Does the area meet IUCN criteria for wilderness?

Yes, and the region has been nominated as a National Park by the IUCN. Much of the study region, if protected, would meet the criteria as IUCN Category I and/or II areas. Category I includes Wilderness Areas and Scientific Reserves and Category II includes National and Provincial Parks, or other types such as Native Parks. Category I lands are intended to provide the least disturbed ecosystems for scientific monitoring, baseline studies, and conservation of biological diversity.

27. Does the area meet criteria for provincial wilderness area designation under the Forest Act?

All criteria for wilderness area designation are met.

28. Do the rivers meet Canadian Heritage River criteria for designation?

The upper Alsek is a Canadian Heritage River now, the lower river meets all criteria. The Tatshenshini River would qualify as a Canadian Heritage River on natural, cultural and recreation resource themes. Both rivers meet Heritage River integrity guidelines.

29. Does the area meet criteria for national or provincial park designation?

No other provincial parks protect examples of this regional landscape. The area meets all criteria for park designation under landscape, backcountry recreation and tourism route criteria.

From a National Parks perspective, if biotic and abiotic criteria representative of an ecoprovince are found in a region which is a "gap" in the system of National Parks, it would qualify as a national Area of Canadian Significance (Eidsvik, 1992). The protection provided by Kluane National Park in Natural Region 6 does not represent all parts of the ecoprovince, and the Tatshenshini-Alsek area has been assessed (in 1976) for its potential inclusion in the park. The area would add several national park themes to Kluane.

TABLE 6: SUMMARY OF WILDERNESS ATTRIBUTE SIGNIFICANCE

	Significance			
Attribute	**Regional**	**Provincial**	**National**	**International**
Ecoregion/section Scarcity	-	X	X	?
Ecoregion Represent-ativeness	X	X	X	?
Ecological Integrity	X	X	X	?
Biodiversity	X	X	X	?
Geology Features	X	X	?	?
Geomorphology Features	X	X	X	X
Vegetation Species Diversity	X	X	?	?
Wildlife Species Diversity	X	X	?	?
Species Rarity	X	X	X	?
Cultural Heritage Features and Diversity	X	X	?	?
Visual Features	X	X	X	X
Recreation Features	X	X	X	?
Adventure/ Ecotourism Capability	X	X	X	X
Wilderness Attributes Summary	X	X	X	X

8.4 ASSESSING THE TATSHENSHINI AND ALSEK RIVERS IN A PROVINCIAL AND NATIONAL CONTEXT

Wild rivers are themselves an important wilderness and recreation resource in British Columbia and Canada, with few navigable watersheds in the province protected by parks or other reserves. This study has reviewed wilderness values for the Haines Triangle area, of which the Tatshenshini and Alsek Rivers are an important part. The two rivers have received international attention as destinations for wilderness rafting and kayaking.

No known concerted effort has yet been made to compare the Tatshenshini or Alsek Rivers with other provincial, national or international wild rivers. The following comparison between north coast rivers should be qualified: each river has its own character, enjoyed by users for different reasons. Any attempt at comparison is inevitably subjective, even though it may be based on criteria such as scenic quality, whitewater challenges, or wilderness character.

Many statements have been made concerning the significance of the Tatshenshini and Alsek Rivers. Although the two rivers are often described as one, each has distinctive characteristics some of which are best assessed independently. See Table 7 below for an outline of river features.

This study concludes that:

The Tatshenshini-Alsek Rivers are among the top fourteen wilderness rafting routes in the world, as determined by commercial guides and outfitters providing adventure tourism services.

In a global context the Tatshenshini-Alsek Rivers are among the best of only a few rivers offering similar characteristics. The Copper River in Alaska and the Stikine River in B.C. compare favourably with the Tatshenshini and Alsek Rivers. The lower Stikine lacks whitewater rafting challenges and the same degree of wilderness integrity, while the Copper River has adjacent, if not always visible, roads.

On a broader scale, the Tatshenshini-Alsek Rivers compare favourably with the Grand Canyon portion of the Colorado River and with the Nahanni River in Nahanni National Park. Although the landforms of each river are different, they are equally exceptional. While the Colorado has whitewater superior to the Tatshenshini, it does not match the wilderness attributes and wildlife diversity of the Tatshenshini or Alsek.

There are no other coastal wild rivers in British Columbia providing a ten day or more uninterrupted wilderness experience. Of the four provincial north coast rivers passing through the coastal ranges, the Tatshenshini and Alsek Rivers are unmatched for their combined scenic quality and diversity, biological variety related to the meeting of different biomes, whitewater challenges accessible by raft or canoe/kayak, ease of access, and overall wilderness attributes.

Stikine River

The upper and lower Stikine River, together about 640 kilometres in length, is no less exceptional than the Tatshenshini-Alsek Rivers, but for different reasons. The lower Stikine provides a three to five day 210 kilometre scenic wilderness trip through glaciated mountains. It is most suitable for rafters and canoeists at a beginner or intermediate level of experience, rated at Class I with rapids to Class II. Log-jams crowd some sections of the lower river.

The lower Stikine River is comparable to the Tatshenshini-Alsek, but does not offer the ten day trip length, whitewater, or as easily accessible glaciers and alpine hiking. Wildlife viewing values are high, particularly near the extensive wetlands adjacent to the river. The Stikine River has a rich native and European history related to trading, harvesting, exploration, gold seeking and transportation. One town, Telegraph Creek, is located on the river. Boaters may stay in public cabins on the Alaskan side of the river, or visit the hot springs near the end of the trip.

The river today has a variety of land uses, some less compatible with wilderness recreation uses. The wilderness character on the lower river is affected by timber harvesting operations, a fish plant, and homesteads. Cultural features such as homesteads or commercial fish processing operations may provide added interest to many people, but may reduce the wilderness character as perceived by other river travellers. The upper Stikine, above the Cassiar Highway provides a lengthy and attractive wilderness rafting, canoeing or kayaking trip in an interior ecosystem. A railway bridge and highway cross the river. The upper portion of the river is in Spatsizi Provincial Park.

Access to the upper Stikine is by floatplane, with the take-out at the Cassiar Highway. Access to the lower Stikine is by road from Telegraph Creek, with egress by floatplane or scheduled service from Wrangell, Alaska.

Taku River

The Taku River, flowing for 90 kilometres from south of Atlin in B.C. to Taku Inlet northeast of Juneau, Alaska, is a scenic two to four day trip through the coast mountains. The river is suitable for novice paddlers or rafters, with few log jam hazards and a Class II rating (Wilson, pers. comm.). The Taku River also has several outstanding tributaries providing challenging whitewater kayaking and canoeing in a wilderness setting (Moise and Wilson, pers. comm.) Twin Glacier is accessible from the river, although hiking is generally limited off the river due to dense forest. Fishing, wildlife viewing, hunting and climbing are popular activities in the valley. The Taku River has an interesting Tlingit history associated with it, as well as more recent European exploration and mining history.

The Taku River lacks nationally significant scenic quality and diversity, has a swift current but no whitewater, and has a variety of land uses not necessarily compatible with wilderness recreation uses. Cottages are located along the banks throughout the lower section of the river, and commercial fishing or recreation by power boats affects the wilderness character (Moise, pers. comm.).

Copper River

The Copper River in Alaska is comparable to the Tatshenshini-Alsek Rivers in that it passes through the coastal mountains, has glaciers descending to river level, and provides a long 400 kilometre scenic raft or canoe trip in a wilderness setting. The Copper River is bounded on one side by the Wrangell-St. Elias National Park and Preserve, and flows through Chugach National Forest. The Copper River has an overall Class II rating, with little whitewater, but

has a few difficult sections where glaciers calve directly into the current. Wildlife viewing is considered good, with eagles, bears, waterfowl and seals visible (Alaska Wilderness Milepost, 1992).

The river has the Richardson and Glenn highways alongside, but they are rarely within sight or sound (Alaska Wilderness Milepost, 1990). Access and egress are by highway, although paddlers may travel along the coast to Cordova to take out.

Tatshenshini-Alsek Rivers

The Tatshenshini River is eminently suitable for rafting, providing enjoyable whitewater in canyon sections, fast current throughout, and spectacular mountain and glacial scenery in a wilderness setting. Rapids to Class IV are found in the upper river, with occasional Class II and Class III rapids lower down, depending on water levels. The river is 193 kilometres long, flowing through a landscape appearing undisturbed to the river traveller (an old placer mine is located at Squaw Creek). Access is via the Haines Highway, but egress is by airplane only, from Dry Bay. The Tatshenshini flows through remote wilderness, with good wildlife viewing, hiking and climbing opportunities from the river. Some of the largest valley glaciers in Canada descend to near the rivers edge.

The Alsek River starts in Kluane National Park, with rapids to Class III and IV before Turnback Canyon with rapids to Class V. Turnback Canyon is navigable only by expert kayakers at certain water levels, otherwise demanding a 15 kilometre portage or a "fly-around" the Tweedsmuir Glacier . The upper portion of the river flows through scenic glaciated mountains, with views of the St. Elias icefields and large valley glaciers. Lowell Glacier creates a large lake part way down, and has dammed the river in the past. Wildlife viewing is considered good for large mammals and birdlife. Hiking is excellent.

The Alsek is 370 kilometres long, with access by highway and egress only by airplane from Dry Bay. The river flows through undisturbed wilderness with no development throughout its length (the Windy Craggy site is not visible from the river, and is some distance away).

Few navigable rivers with wilderness characteristics are protected in British Columbia, even fewer throughout their length.

The short Spatsizi river has full protection (Spatsizi Wilderness Park); the upper Stikine (Spatsizi Wilderness Park) has partial protection on one bank; the Bowron Lakes chain has full protection (as a river and lake circuit in Bowron Lakes Provincial Park); the Fraser and Robson Rivers (Robson Provincial Park) have small sections protected; the Kootenay River (Kootenay National Park) has its upper one-third protected; as does the Kicking Horse River (Yoho National Park). The last three of these example rivers provide short whitewater day adventures.

Table 7: How The Tatshenshini-Alsek Rivers Compare With Other Rivers

RIVER NAME	BIOLOGICAL & EARTH SCIENCE FEATURES	CULTURAL FEATURES	SCENIC QUALITY & NATURALNESS	WILDERNESS & ECOLOGICAL INTEGRITY	RECREATION USE AND POTENTIAL
Tatshenshini	mountain, glacial landforms and river morphology; high biodiversity of 2 ecoregions; rare species, diversity;	native heritage gold rush history exploration & trade scientific discovery	serrated mountains; glaciers to river; undisturbed viewshed; diverse scenery;	intact ecosystems; 10-12 day trip; remote wilderness;	rafting, canoeing, kayaking; experienced wilderness travellers unless guided on raft trip; Class III and IV whitewater; road in, fly out
Alsek	mountain, glacial landforms; river morphology, canyons high biodiversity of 3 merging ecoregions; rare species, diversity; ice-dammed river history;	native heritage	glaciers to river ice-field views rugged mountains undisturbed viewshed deep rock canyons	intact ecosystems; 10 day trip; remote wilderness	rafting, kayaking, canoeing commercial and private use now; Class III-V whitewater; experts only; long portage or "fly-around"; road in, fly out;
Stikine	mountain, glacial landforms river morphology; transition from interior to coastal ecosystems; "Grand Canyon"; wildlife diversity;	native heritage and trade; European exploration and transportation, trade; historic village of Telegraph Creek; homesteads today;	alpine tundra to coastal forest, glaciers to river; diverse scenery; lower river viewshed disturbed by logging; natural setting but for roads; rail, village in middle part;	other land uses in area in area; roads, rail, village intact on upper river; 8-12 day trip overall; 3-5 day on lower river; logging operations on lower; remote wilderness on upper;	canoeing, rafting, kayaking; trip divided in two by Grand Canyon; Class III on upper; Class I-II on lower; upper river for intermediate paddlers; lower river for novice-intermediate; fly in to upper river, road out; road in to lower river, fly out;
Taku	mountain, glacial landforms; coast mountains ecosystem	native heritage, trading; mining history; European exploration;	forested mountains; glaciers to near river; cottages in lower river;	other land uses in area; 2-3 day trip	canoeing, rafting; Class I-II, no whitewater;
Copper	mountain, glacial landforms; coast mountains ecosystem; canyons;	native heritage;	forested mountains; glaciers to near river; highways seen occasionally;	roads parallel the river; 7-9 day trip	rafting, canoeing, kayaking; Class II, one rapids difficult; intermediate paddlers;

8.5 SUMMARY OF WILDERNESS STUDY CONCLUSIONS

This study reviews much of the literature and anecdotal information available for the Tatshenshini-Alsek region. It concludes that the many public statements made about the region's superlative biotic, abiotic and cultural features in a scenic wilderness setting are accurate. As the first effort at a comprehensive summary of wilderness resources in the region, the study reveals that appreciation for the region's attributes has, if anything, been undervalued.

The main conclusion of this work is that very little is known about the Tatshenshini-Alsek region. More questions than answers remain about the wild species and natural forces that shape the environs. There is little understanding of how changes in land use might affect wildlife habitat, or plant and animal species populations. These questions are described more fully in a recommended research program found in the report.

This assessment confirms that the Tatshenshini-Alsek region has, in a provincial, national, and in some cases international context*:

Primary Attributes of the Tatshenshini-Alsek Region

- **outstanding examples of representative landscapes,**
- **habitat essential for the preservation of rare species,**
- **habitat essential for the survival of significant populations of terrestrial mammals, avifauna, and freshwater fish,**
- **areas and sites of significant cultural, archaeological, historical and traditional resource gathering value,**
- **examples at specific sites of outstanding or unique landforms or geological features,**
- **outstanding areas for public recreation, tourism and nature or culture appreciation,**
- **outstanding wilderness attributes as a composite of all of the above criteria.**

* These criteria are adapted from the Protected Areas Vision for Canada (1991) by the Canadian Environmental Advisory Council, who in turn based them on the report of the Northern Task Force on Conservation (1984).

Specifically, the most notable features of the Tatshenshini-Alsek Region include:

- the Alsek Ranges ecosection has ecological conditions found nowhere else in Canada,
- unusual biological diversity for such a high latitude, resulting from a coastal influence and the meeting of several different biomes,
- at least two provincially rare mammal species such as the tundra shrew and collared pika, and two rare sub-species including the blue glacier bear, and Dall's Sheep,
- several provincially rare bird species including king eider, Arctic tern, gray-cheeked thrush, lesser gold-plover, Pacific loon, wandering tattler to name a few,
- at least 30 provincially rare plant species, some of which may be rare to Canada, including "northern" ground cone,
- numerous notable wildlife species populations inhabiting an intact wilderness ecosystem, including grizzly bear, Dall'sheep, bald eagle, moose, gyrfalcon, peregrine falcon,
- some of the best grizzly bear habitat in Canada,
- nationally significant geomorphological features and processes, relating mainly to glacial and fluvial processes,
- provincially significant cultural features including native heritage, archaeological sites, historic sites and routes,
- nationally significant recreation features, and wilderness recreation capability,
- internationally significant adventure tourism capability
- substantial economic values to the region and province are derived directly from the study areas wilderness attributes,
- regionally significant subsistence harvesting.

The mosaic of wilderness attributes, natural and cultural resources found in the study region are not protected elsewhere in Canada or the United States. Many of these attributes and resources are unique to the region, not found elsewhere in Canada or British Columbia. Nearby Kluane National Park Reserve in the Yukon, and Glacier Bay National Park and Preserve in Alaska are of world heritage stature, yet they are incomplete representations of the region's biological diversity.

The study further confirms that the Tatshenshini and Alsek Rivers are nationally and provincially significant wild rivers. Along the Canadian northwest coast only four rivers, the Stikine, Taku, and Tatshenshini-Alsek have similar characteristics. When all assessment criteria are compared, the Tatshenshini-Alsek Rivers have superior wilderness attributes, including diversity of landforms and biophysical resources, scenic quality, recreation features and wilderness recreation and tourism potential. Only the Stikine River provides a comparable wilderness recreation experience through interior, transitional and coastal ecosystems.

9.0 RESEARCH NEEDS AND RECOMMENDATIONS

9.1 WHAT IS KNOWN AND WHAT IS NEEDED

What Is Known

Much of the biophysical information summarized in this report pertains to studies done outside or on the fringes of the study region. The majority of biophysical information in the study region is based on 1:250,000 scale mapping, reconnaissance surveys, environmental impact assessments for specific projects, and anecdotal references. Limited detailed biological inventory work has been done on habitat, species occurrence, or ecological interrelationships. The mid-1950s to 1983 Royal British Columbia Museum expeditions to the Tats Lake, Tatshenshini River and Haines Road area resulted in extensive mammal, avifauna and botanical collections for specific areas, but ecosystems mapping or ecological data were not part of these projects. Much of this information is in computer print-out form, yet to be assessed or placed in a regional context. Several rare and unusual species were observed during the expedition and some of these are listed in the report.

High profile species such as the Dall's sheep are better known, but information on distribution, critical habitat, and predator-prey relationships for large or small mammals is still sketchy at best. Existing terrain and ungulate capability mapping, while very useful, is at a scale of 1:250,000. Although inferences from more detailed work in Kluane National Park may be made for parts of the Tatshenshini-Alsek study area, the reliability of any conclusions from such comparisons is suspect.

Further research requirements in the study area have been outlined by several provincial and federal agencies, most in response to the Stage I environmental assessment by Geddes Resources (1990). The Sierra Club of Canada, in conjunction with Tatshenshini International, is also proposing to carry out comprehensive biophysical research during the next two to three years (Hamilton, pers. comm.) The Champagne-Aishihik First Nation has proposed a variety of cultural research projects including archaeological work (Gaunt, pers. comm.). In Alaska, the U.S. Forest Service is preparing a plant community classification for the Yakutat foreland, and various cultural research projects are underway in the coastal area.

Recreation features and visual resource inventories have been completed for much of the region, and the data on recreation use is adequate. Economic revenues related to river-dependent wilderness resources in the region are fairly well understood for specific activities such as rafting or commercial fishing. No comprehensive assessment of all wilderness related revenues and values, non-use preservation values or regional tourism benefits has been undertaken.

Many of these identified research needs are relevant from a wilderness perspective with or without mining or other resource development. This study highlights the need for further basic research to provide a better understanding of natural and cultural resources. Each section of the report has recommendations on research needs in specific topic areas. These are summarized below in order of priority.

What Is Needed

Much research needs to be done, yet this study demonstrates clear priorities in the wilderness context: basic biological information focussing on habitat, species occurrence, distribution and ecology in the study area, and basic cultural resource information. Without this information, decisions on future land uses in the region as well as any potential wilderness management program will not be based on sound knowledge. The ecological and cultural conditions in much of the study area are found nowhere else in Canada, and without basic biological and cultural research the risks associated with any future land use decisions will not be well understood. It is not clear how well Kluane National Park represents Natural Region 6, in light of new information emerging about the lower Tatshenshini-Alsek Rivers.

Cultural resources research, particularly archaeological work is also a high priority. It is not known, for example, if recreation use is affecting archaeological sites. Rock petroglyphs or other archaeological resources are potentially at risk as their locations become known by more users.

The environmental impacts of the proposed mine and access road have been assessed with respect to specific environmental resources, but no comprehensive assessment of development impacts on the regional wilderness resources has been undertaken. The detailed biological, cultural and economic information required for such an impact assessment has not been available. This report is the first comprehensive effort to describe and analyse regional wilderness values.

Merging Scientific and Traditional Native Perspectives

How we catalogue and interpret the natural and cultural resources of wilderness areas reflects our intentions in managing them. The obstacles faced are expressed well by Cruikshank (1981), where she suggests that, "...western intellectual tradition has distinguished between non-western and western or 'primitive' and 'modern' thought. Western tradition is viewed as 'objective' knowledge, and non-western tradition is viewed as 'magic' or 'religion'."

Oral traditions about both historical and natural events in aboriginal cultures, however, often have highly technical information, reflecting knowledge that was an adaptive strategy for survival (Cruikshank, 1981). Native tradition about landforms, geology, fluctuations in game and other natural cycles provide a view of the natural environment different from our own, and often at odds with our pre-conceived notions about how best to classify and manage . Western scientists are ill-equipped to understand such information because their framework for viewing ecology is so narrow (Cruikshank, 1981). Cruikshank further observes that western science is seen to be the superior model of explanation and that oral tradition is useful only to the extent that it can confirm views put forward by scientists (Cruikshank, 1981). Athapaskans on the otherhand might "consider the scientist culturally impoverished because his view encompasses half of reality" (Cruikshank, 1981). Although most scientists and many native people would acknowledge the limitations of relying solely on oral tradition for resource information, the point is made that "if oral tradition is bound by its own cultural context, so is science" (Cruikshank, 1981).

These observations on oral tradition suggest that our usual scientific approach to inventorying wilderness resources is not good enough. If our knowledge is incomplete or culturally biased, then our ability to interpret, plan, and manage will also be lacking (Peepre, 1992).

Recreation and Tourism

Further research on recreation features, tourism capability and viewsheds, in the opinion of the author would not contribute to a better understanding of wilderness values. Such studies would divert resources from the priority areas and these aspects have already been adequately studied (J.S. Peepre and Associates, 1986, Juan de Fuca Environmental Consultants, 1986, Geddes Resources, 1990). Further visual impact assessments using digital terrain modelling would be useful to assess potential roads or other developments, but this mitigation work is not part of the proposed basic wilderness research program.

Recreation and tourism research, however, are an important part of applied ecological research. Research should focus on predicting the ability of ecological communities to withstand future recreation and ecotourism use. Further applied recreation and tourism capability research would also be appropriate to support any future wilderness or park management initiatives.

Economic Values

Further comprehensive research into the economic value of wilderness in the region is warranted. Previous research has been cursory, and this study has merely shown the need to expand the scope of such research. Further research should assess recreation use values, non-use preservation values, commercial and subsistence values, as well as wilderness oriented regional tourism values in all adjacent jurisdictions.

Priorities Within the Region

Long term biophysical research should encompass the entire region, but with an initial focus on the lower Tatshenshini and Alsek Rivers. The section of the Tatshenshini River valley from the O'Connor Creek confluence to the Alsek River and the Alsek River south of the Yukon border, should be the highest regional priority. This area has been studied the least, yet is known to include ecological conditions and rare species found nowhere else in Canada. Some of the other interior parts of the study region, while very important to the wilderness mosaic, are more similar to areas in Kluane National Park or other better understood interior ecosystems of the Yukon or northwestern B.C. Biological research priorities in these areas of the study region are not as pressing.

Information on the Haines Highway corridor, the Tarr Inlet area, headwaters of the Tkope River and other areas should be part of the research program, if only at a reconnaissance level. The Haines Road area is already well known for its unusual biodiversity and rare species. Avifauna have been extensively researched there, and no further immediate work is proposed in this study.

Since the proposed research should focus on ecosystems mapping and species occurrence, the research program should be designed to assess resources in a regional and provincial context. Thorsell's (1992) guidelines for research in protected areas are applicable for the proposed research in the study region. Some of the questions Thorsell identifies as important, and adapted here to the Tatshenshini-Alsek study are:

Biophysical Sciences

Inventory:
What plants, animals and other natural resources are present? How are they distributed in space and time?

Species Needs
What are the habitat requirements, food, mineral and water needs of species having special management significance?

Ecological Relationships
Who eats what? What depends on what? What are the key species maintaining the integrity and functioning of the ecosystem?

Dynamics of Change
What are the population trends within species?

Socioeconomic factors and resident populations
What are the effects of the wilderness resources on the local economy and society? What traditional knowledge of the area's wilderness resources is there? What is the history of human occupation?

Economic valuation
What are the estimates of the wilderness resource economic values in protecting watersheds and fisheries, ensuring the conservation of biodiversity, and tourism expenditures? What is the role of the wilderness area in regional economic development and local employment?

Recreation and tourism
What is the market area of the wilderness region? How many visitors use the wilderness resources? What impacts do visitors have? What are visitors attitudes before and after their visit?

9.2 RESEARCH RECOMMENDATIONS

This section outlines long term research needs to establish wilderness values in the Tatshenshini-Alsek region. Development impact studies, for example related to access roads, are not part of these recommendations for basic research. These recommendations are based on the premise that site specific development impact studies cannot appraise effects on wilderness until the wilderness characteristics of the region as a whole are better understood.

Basic Biological Research Recommendations

1. Develop quantifiable baseline information on plant and animal species occurrence, habitat use, distribution and ecology in the region, focussing first on the Tatshenshini-Alsek River valleys, and in particular the lower reaches of these rivers. Develop and manage the biological research program with an interagency team of experts in biological and earth sciences.

2. Conduct research into habitat, range, population characteristics, and ecological interrelationships of notable or unusual species in the region including blue glacier bear, grizzly bear, collared pika, falcons and other avifauna, and further species as identified. Focus on the Tatshenshini-Alsek corridors first, but include entire region.

3. Map ecosystems of region, focussing first on Tatshenshini-Alsek River corridors, but including entire study region. Tie mapping in with existing Kluane work, and include the Haines Highway corridor.

Specific research needs identified by various agencies and supplemented by findings during this study include (in no particular order, and with overlapping focus):

- determine basic occurrence and distribution of wildlife habitat and populations, ecological interrelationships,
- determine the basic occurrence and distribution of aquatic habitat, species using the habitat, ecological relationships and their significance, both within the aquatic systems and with the surrounding terrestrial habitats;
- determine basic occurrence and distribution of vegetation habitat and populations, ecological interrelationships,
- define, describe and classify the vegetation communities in the study region,
- develop ecological interpretations of the process influencing the plant communities,
- conduct detailed ecosystems mapping in river corridors valleys,
- identify critical habitats for key species, including winter range, calving, lambing and denning areas, migration routes etc),
- identify distribution, numbers and seasonal movements of mountain goats, sheep, and grizzly bears,
- conduct basic research on distribution and ecology of known unusual species such as blue glacier bear and the collared pika,
- conduct basic research on grizzly bear habitat and population,
- identify unique geological and geomorphological features in the region,
- assess biodiversity of region in context of habitat, species and ecosystems research,
- determine best areas for wildlife viewing,
- complete 1:50,000 scale wildlife habitat mapping prior to any proposed development in the region,
- map all habitats that are rare, support a wide range of species or are especially productive,

Cultural Resources Research

4. Conduct an archaeological overview assessment of the Tatshenshini-Alsek Rivers and tributary streams. Assess the condition and vulnerability of known archaeological sites. Follow-up reconnaissance work with detailed assessments as identified. Recommend a management strategy.

5. Identify potential archaeological sites in the remainder of the region, particularly along the Dalton Trail route, or other known native trade and travel routes, for example on tributaries of the Tatshenshini River. Conduct reconnaissance inventory of potential archaeological resources.

6. Conduct oral history work with the Champagne-Aishihik First Nations as part of archaeological, historical and other cultural research in the region.

7. Conduct an historical resources inventory and assessment of the region, including along the Tatshenshini-Alsek Rivers, Dalton Trail/Chilkat Trail route, Dalton Post/Shaw'ashe, and old mining camps throughout the region. Recommend a management strategy. Design the research to supplement known information and sites.

Economic Research

8. Conduct a comprehensive economic assessment of wilderness values in the study region including recreation use values and non-use preservation values. Include subsistence values, commercial values, regional and provincial tourism benefits.

Specific research needs identified by various agencies and supplemented by findings during this study include (in no particular order):

- conduct a comprehensive economic assessment of wilderness resources,
- modify existing methodologies as required to assess non-use preservation values in the region,
- assess regional tourism impacts of wilderness preservation,
- assess net economic benefits to region and province of retaining area in wilderness

Limits of Acceptable Change

9. Conduct research into recreation use impacts by establishing baseline information at known campsites, trails, wildlife viewing areas, and other sites potentially impacted by visitors. Focus on Tatshenshini-Alsek corridor. Establish monitoring program.

Further specific research needs are:

- determine baseline conditions of popular campsites on rivers, set up monitoring program,
- assess impacts of existing recreation use on plant and wildlife habitat and species populations,

Geological and Geomorphological Resources

10. Conduct an inventory of significant geological and geomorphological features and processes in the study region. Assess these features from a scientific research and interpretive perspective.

Recreation Use

11. Conduct a recreation user survey of river travellers to update the 1985 study on demographic characteristics, attitudes to wilderness and management preferences. Conduct this study by 1994.

12. Conduct a survey of Haines Highway users to determine attitudes to wilderness, wildlife viewing and scenic quality in the region, spending habits, recreation activities. This survey could be done in conjunction with the comprehensive economic research.

Recreation and Visual Features Mapping

13. Require proponents to prepare comprehensive recreation features, visual features and visual sensitivity mapping for any proposed development areas.

Representation by Existing Parks

14. Assess the Kluane National Park Reserve representation of ecosystems in the region.

Research Data Base

15. Develop a Geographic Information System (GIS) mapping system for the region to record natural and cultural resources. Design the mapping conventions for maximum ease of incorporating research data as it becomes available, and with a long term objective to produce GIS-based resource analysis for management purposes. Use mapping conventions consistent with existing Ministry of Environment and other agency systems.

    This recommendation is listed last, but is a high priority related to all research topics.

9.3 RESEARCH METHODOLOGY, SCHEDULE AND BUDGET

9.3.1 Methodology: Options "A" and "B"

The research methodology is outlined as two options, but they are not mutually exclusive. Option "A" including long term research priorities as recommended above, is the preferred option and should be completed over a three year or longer period. Some land use decisions in the region, however, must be made before such a research program would be complete. Option "B" outlines what research could be completed in a one year period, using the 1992 field season to collect all necessary data. Option "B" could produce the minimum wilderness resources information needed to assist land use decisions in the region. Completion of Option "B" research should not preclude further wilderness research. The natural and cultural resources of the region are complex and nationally significant; they merit further long term research attention.

Option "A": Long Term Research

Carry out the first ten research recommendations noted above in a three year program to complete biological and cultural resource inventory and mapping work in the study region.

Option "B": Short Term Research

Concentrate the highest priority research into one year, focussing the inventory and mapping on the least known and potentially most significant areas of the study.

Approach to Research

Ecosystems mapping should be completed at a scale of 1:50,000, and include baseline data on surficial geology, vegetation and soils. Overlay mapping for selected wildlife habitat capability, for example ungulates or grizzly bears, should be part of the inventory and mapping project. The research methodology should conform to existing provincial biogeoclimatic mapping standards with one exception: *greater emphasis should be placed on identifying small mammals, avifauna, aquatic and other wildlife species, and their relationship to plant species and communities*. Small mammals, avifauna, and other species are an important aspect of wilderness values and biodiversity. For example, many rare bird species are known to occur in the region, and large mammal habitat capability mapping alone would not capture this information.

Recent costs for similar work in remote regions are in the order of $20,000 per map sheet for basic 1:50,000 scale ecosystems mapping, with additional costs per map sheet for wildlife species habitat overlays. Collections or observations of small mammals, avifauna and botanical specimens should be made as part of the proposed mapping project, with increased costs per map sheet.

Many of the following logistical suggestions are relevant to both Option "A" and "B":

1. Conduct the research over a three year period, with field work conducted from June to August each summer.

2. Use one research coordinator to facilitate the research in different disciplines, under the overall guidance of an interagency research task group. Focus on a basic inventory and ecosystems approach to the research. Co-ordinate research with other organizations, such as the Champagne-Aishihik First Nation or Sierra Club, wherever feasible. Screen biological research proposals for scientific validity.

3. Establish field camps on lower Tatshenshini-Alsek as required, with a single base operation, possibly at the Windy Craggy site. Organize flying schedules and routing to minimize potential conflicts with wildlife and recreational wilderness users.

4. Send interdisciplinary crew of researchers down the entire length of the Tatshenshini and Alsek Rivers, focussing on the area below O'Connor Creek on the Tatshenshini

and below the Tweedsmuir Glacier on the Alsek. Although of lower priority, send a team to Tarr Inlet and upper Tkope River area and other selected sites in the region to complete reconnaissance level biological inventory and assessment work. In the first year, identify data gaps in the Haines Highway corridor, and conduct further required work in subsequent years.

5. In the first year, conduct basic species inventories and ecosystem mapping, followed up in subsequent years by more specific studies as identified.

6. Use accepted scientific methods to produce quantifiable results for all work, complemented by #7 below.

7. Ensure that data gathering includes information and interpretation from both a scientific and native oral literature perspective. If oral traditions have not been adequately recorded, ensure they are, during future planning work.

   Record both visible resources, such as artefacts, and invisible resources such as spiritual landmarks, or other culturally important places. Understand and use native place names. Ensure the resource inventory moves beyond static lists of species, to include an understanding of the area's human ecology. Incorporate the scientific and native perspectives on resources into all management initiatives.

8. Produce annual research summaries after each field season. At the end of the research period compile a report on the natural and cultural resources of the region. Update this wilderness values study if required.

9.3.2 Schedule and Budget

Option "A: Long Term Research

A program is proposed over a three year period to complete the **higher priority** research tasks. Some components of the research could be funded and completed by others. Independent research by different agencies may also be carried out using existing research or mapping programs. Mitigation research, such as visual impact assessments are not included in this work. GIS mapping costs should be included as part of the mapping budget. Table 8 shows the recommended Option "A" research program in matrix format. See also the research recommendations above for details on the type of research.

Year 1:

- conduct baseline inventory and biophysical mapping, at 1:50,000 scale,
- initiate notable species research,
- initiate cultural heritage overview assessment,
- identify further research requirements,
- prepare annual research summary,

Year 2:

- conduct baseline inventory and biophysical mapping, at 1:50,000 scale,
- complete detailed studies as identified in Year 1,
- conduct detailed cultural heritage research as indicated by first year program,
- continue notable species research,
- prepare annual research summary,

Year 3:

- complete baseline inventory and mapping,
- complete detailed studies as identified in Year 1,
- complete notable species studies,
- complete cultural heritage research,
- update this wilderness values study based on research results,

Option "B": Short Term Research

Year 1:

- complete 1:50,000 scale ecosystems mapping for lower Tatshenshini and Alsek Rivers,
- conduct overview archaeological assessment along Tatshenshini-Alsek Rivers and selected tributary streams,
- assess economic values related to wilderness in the region,

The highest priority area for the Option "A" program is the lower Tatshenshini-Alsek River region. This area encompasses six 1:50,000 scale map sheets. If all of these were mapped, the cost could be prohibitive. Alternatively, five of the map sheets would cost 20-25% less, leaving funds for an economic study, and an archaeological reconnaissance.

TABLE 8: SUMMARY OF LONG TERM RESEARCH PROGRAM

Topic	Priority	1992	1993	1994	Notes
Ecosystem Mapping	High	X	X	X	
Wildlife Species Occurrence/ Ecology	High	X	X	X	
Vegetation Species Occurrence/ Ecology	High	X	X	X	
Special Wildlife Species Research	High	X	X	X	grizzly bear blue glacier bear
Archaeology Assessment	High	X	X	X	
Oral History Work	High	X	X	-	
Economic Assessment	High	X	-	-	
Historic Resources Inventory	Moderate	-	X	-	
Geology Features	Moderate	-	X	-	
Geomorphology Features	Moderate	-	X	-	
Visual Resources Mapping	Low	-	-	-	mitigation only
Recreation Features Mapping	Low	-	-	-	mitigation only
Tourism Capability Mapping	Low	-	-	-	
Recreation Surveys	Low	-	-	X	

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Alsek Ranges and Sediment Creek. (T. Vold)

Eastern slopes of Alsek Ranges can provide relatively easy access to alpine by foot from the Tatshenshini River. (T. Vold)

Alsek River with braided channels. Looking west towards U.S. border. (T. Vold)

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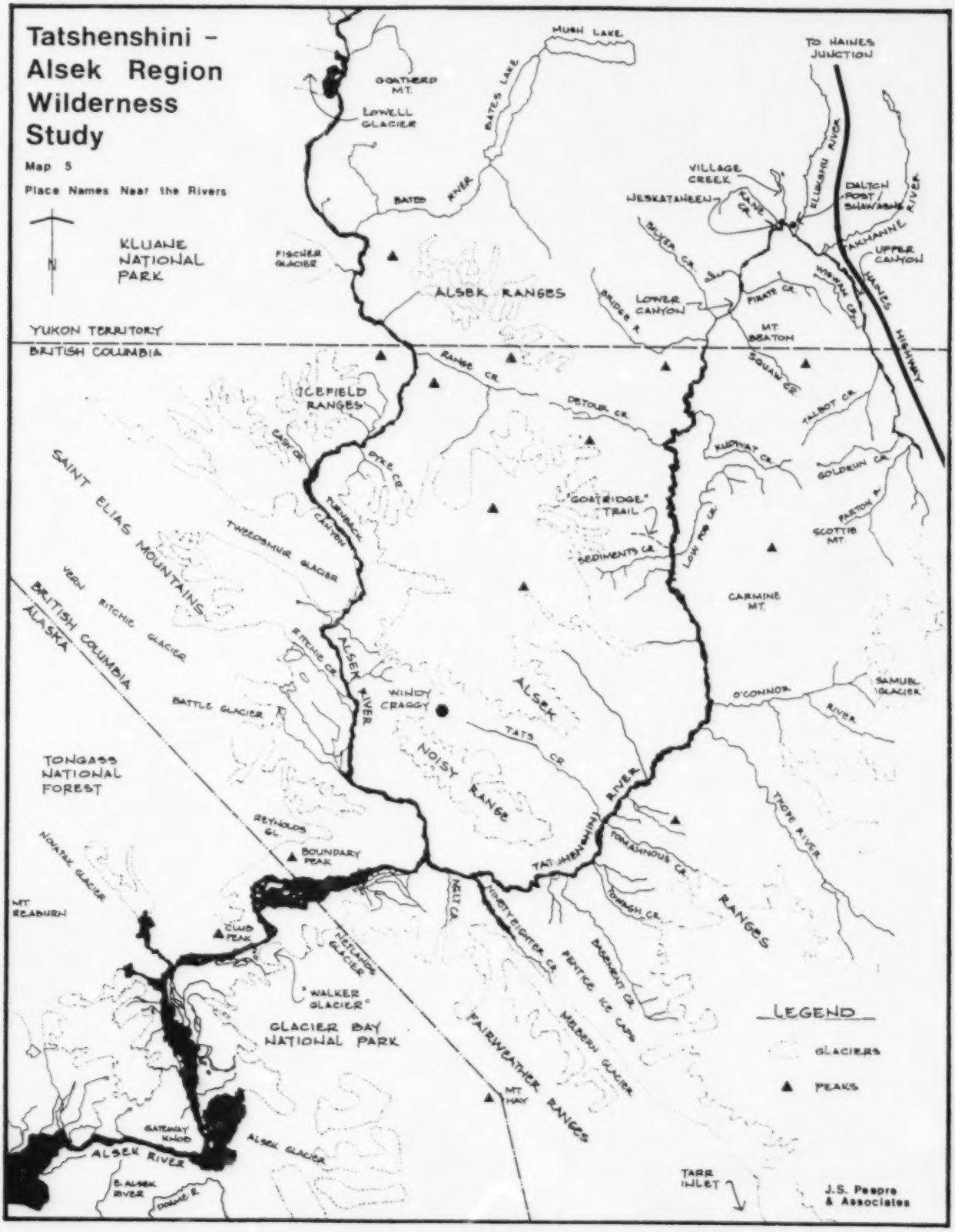
Tatshenshini - Alsek Region Wilderness Study
Map 5
Place Names Near the Rivers
N
KLUANE NATIONAL PARK
YUKON TERRITORY
BRITISH COLUMBIA
ALASKA
MUSH LAKE
TO HAINES JUNCTION
GOATHERD MT.
LOWELL GLACIER
BATES LAKE
BATES RIVER
FISCHER GLACIER
ALSEK RANGES
VILLAGE CREEK
KLUKSHU RIVER
DALTON POST / SHAWARNE
NESKATAHEEN
KLUANE CR.
SILVER CR.
TAKHANNE
UPPER CANYON
LOWER CANYON
PIRATE CR.
WHITEHAM CR.
HAINES HIGHWAY
BRIDGE R.
MT BEATON
SQUAW CR.
RANGE CR.
DETOUR CR.
TALBOT CR.
ICEFIELD RANGES
EASY CR.
DYKE CR.
KLUKWAN CR.
GOLDRUN CR.
SAINT ELIAS MOUNTAINS
TURNBACK CANYON
"GOATRIDGE" TRAIL
PARTON R.
SCOTTIE MT.
TWEEDSMUIR GLACIER
SEDIMENTS CR.
LOW FOG CR.
VERN RITCHIE GLACIER
CARMINE MT.
RITCHIE CR.
ALSEK RIVER
WINDY CRAGGY
ALSEK
O'CONNOR
SAMUEL GLACIER
BATTLE GLACIER
TATS CR.
RIVER
TONGASS NATIONAL FOREST
NOISY RANGE
TATSHENSHINI RIVER
REYNOLDS GL.
BOUNDARY PEAK
TOMMAHNOUS CR.
TROPE RIVER
NOVATAK GLACIER
MT. READBURN
NELT CR.
TOMMSH CR.
RANGES
CLUB PEAK
NESTLANDS GLACIER
"WALKER GLACIER"
WINDY RIGHTER CR.
PENTICE ICE CAPS
BASSHEART CR.
GLACIER BAY NATIONAL PARK
MEBERN GLACIER
LEGEND
GLACIERS
PEAKS
FAIRWEATHER RANGES
MT. HAY
GATEWAY KNOB
ALSEK GLACIER
ALSEK RIVER
E. ALSEK RIVER
DOUGLAS R.
TARR INLET
J.S. Peedre & Associates